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Sustaining a Culture of Excellence: Massive Open Online Course (MOOC) on Land Management

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Abstract: Increasing globalization and the emergence of disruptive learning technologies have derived a pedagogical paradigm shift from the conventional on-campus higher education to the digital and online higher education. Massive open online courses (MOOCs), especially, are the most notable manifestation of educational transformation. We developed a MOOC entitled Introduction to Land Management (ILMx MOOC) for potential entrants to the land management domain, or for those who simply want to become aware of land-related challenges and brought together with thousands of participants worldwide with freely accessible course content and rooms for open discussion. Our experience with ILMx MOOC has accumulated new knowledge and insight across a broad range of questioning on how to design and develop alternative courseware and teach using digital learning technologies in land management. This paper examines an account of emerging patterns of demographics, geography, and course engagement throughout the ILMx MOOC. We found that the subject of land management in digital higher education affects gender gaps in enrolments. We also assume that the topic of land management has been globally recognized as an important nexus to guide professionals in international development studies and practices as well as sustainability research. However, new behavioral patterns of learners were also observed. They participated in the learning process very enthusiastically only during the first month of the course and this seems to be due to lack of motivation and interest to induce learners efficiently into the learning content. We believe that the culture of excellence in land management needs to be accompanied by engaged excellence and new forms of educational culture and work processes. This means that the high-quality and rigorous knowledge we produce and accumulate is coupled closely with new styles of educational development and delivery, new types of resources and hardware, and extensive engagement with countries, localities, people, and practices of those who handle land matters.

Keywords: massive open online course (MOOC), land management; the culture of excellence; digital higher education; knowledge engagement

1. Introduction

At a time of increasing globalization, the emergence of disruptive learning technologies has influenced a pedagogical paradigm shift from the conventional on-campus higher education to the digital and online higher education. According to the 2018 New Media Consortium (NMC) report on changes in educational technologies and content [1], there exist three types of trends which can be roughly summarized as more possibilities to measure learning and learning outcomes; new ways of learning with open educational resources; and the rise of new forms of interdisciplinary studies and cross-sector collaboration. These trends have not occurred in isolation from other developments and pilots. The following Table 1 shows how rapid developments have opened up new avenues for education. In 2011, the introduction of eBooks and mobile devices were the new technological tools,

and initial experiments were executed with game-based learning, think of SIM city for urban planning for example. In the last couple of years, development has accelerated tremendously. First mobile apps and tablets offered more standard and individualized learning possibilities. Then MOOC (massive open online courses) were introduced. In addition, in the last couple of years, we see more possibilities rapidly emerging, such as gamification, flipped classroom, makerspaces, affective computing, learning and predictive analytics, mixed reality (including augmented reality and virtual reality) and adaptive learning technologies and artificial intelligence.

Table 1. Emerging disruptive technologies in teaching and learning for higher education and actual realization periods, data compiled from the New Media Consortium (NMC) Horizon Reports 2009–2018, EDUCAUSE Learning Initiative, www.educause.edu/eli.

Year	Time-to-Adoption of Technologies for Higher Education		
	1 Year or Less	2–3 Years	4–5 Years
2009	• Mobiles • Cloud Computing	• Geo-Everything • The Personal Web	• Semantic-Aware Applications • Smart Objects
2010	• Mobile Computing • Open Content	• Electronic Books • Simple Augmented Reality	• Gesture-Based Computing • Visual Data Analysis
2011	• Electronic Books • Mobiles	• Augmented Reality • Game-Based Learning	• Gesture-Based Computing • Learning Analytics
2012	• Mobile Apps • Tablet Computing	• Game-Based Learning • Learning Analytics	• Gesture-Based Computing • Internet of Things
2013	• Massively open online courses (MOOCs) • Tablet Computing	• Games and Gamification • Learning Analytics	• 3D Printing • Wearable Technology
2014	• Flipped Classroom • Learning Analytics	• 3D Printing • Games and Gamification	• Quantified Self • Virtual Assistants
2015	• Bring Your Own Device (BYOD) • Flipped Classroom	• Makerspaces • Wearable Technology	• Adaptive learning technologies • The Internet of Things
2016	• Bring Your Own Device (BYOD) • Learning Analytics and Adaptive Learning	• Makerspaces • Augmented and Virtual Reality	• Affective Computing • Robotics
2017	• Adaptive learning technologies • Mobile learning	• The Internet of Things • Next-Generation LMS	• Artificial Intelligence • Natural User Interfaces
2018	• Analytics Technologies • Makerspaces	• Adaptive Learning Technologies • Artificial Intelligence	• Mixed Reality • Robotics

This paper zooms in to the use and development of MOOCs. The idea of MOOCs was developed for the first time, with a course entitled 'Connectivism and Connective Knowledge' a decade ago by George Siemens and Stephen Downes. MOOCs provide equal access to education without any distinction of the border, gender, race, class, and bank account through democratizing education and bridging divides [2,3]. According to Robinson and Nelson [4], MOOCs adopted the notion of 'openness' and this particularly relates to the free course, open registration, open curriculum, and open-ended outcomes [5]. Furthermore, facilitating learning at scale is the most prominent and attractive feature of MOOCs that enables to stretch immense and global learners [6]. In addition, the world's top universities have engaged with varying MOOCs platforms with such as Coursera, edX, FutureLearn, Cognitive Class, iversity, and Udacity for knowledge production and sharing their culture of excellence.

MOOCs can work in isolation, as separate learning packages, however they work best a part of more comprehensive learning strategies, which include regular programs which opt for relying on digital materials (digitizing all analogue documents; making video lectures; recording lectures; Skype lectures), blended learning (combining classroom and digital learning phases and methods; creating more flexibility in providing feedback (both direct, online, community groups, etc.)) and online

learning (learning with no or very limited classroom teaching—all happens online—in virtual space). In addition, such types of courseware can be enhanced through learning style, which incorporates:

Interaction and collaboration—using social media and other interactive forms to stimulate independent learning and learning with peers.

Open learning practice—free and open choice of topics and learning methods. Helps the student to create their own independent path and expertise.

Game and simulation—build all learning elements on games and simulation. One can experience results of choices directly and learn from mistakes.

Customized learning—instead of one size fits all, create individualized and personalized programs for each student.

Self-study—no more teachers are necessary. All materials and formats are accessible to anyone anytime anywhere; certificates are generated automatically if a student fulfils all learning requirements.

The Technical University of Munich (TUM) in Germany launched the first 'TUM MOOCs' initiative in 2013 with €250,000 for production and delivery of five courses in cooperation with Coursera and edX platforms. Following the great success of the first MOOCs initiative, TUM again invested €250,000 in 2016 for the production and implementation of up to 10 other MOOCs under the 'MOOC for MASTERS' initiative. It aims at helping students obtain successful Master's degrees that convey essential foundations and offering the students the opportunity to get to know the expected level of performance for a Master's program at TUM. With these bridging courses, the university wants to address not only its own students but also international applicants [7]. A course entitled '*Introduction to Land Management* (referred to as ILMx MOOC throughout this paper)' was one of the second initiatives and the course is designed for potential entrants to the land management domain and for the Master program of land management and land tenure (LMLT) within the institution. More importantly, this MOOC is a strategic choice that provides an additional means of building capacity globally. The first ILMx MOOC was opened for enrolment on edX from September 2017 to January 2018 and attracted approximately 2800 participants from 160 countries. The second run of this MOOC was successfully completed in 2019 (accessible from September 2018 to January 2019) that reached around 2000 enrolments from more than 140 countries.

Our experience with ILMx MOOC has accumulated new knowledge and insight across a broad range of questioning on how to design, develop, and teach a MOOC in land management. This paper examines an account of emerging patterns of demographics, geography, and course engagement throughout the ILMx MOOC. This study aimed to address the following research questions: who might have been attracted by the first and second ILMx MOOC and what motivates them? How learners have interacted and persisted in pursuing coursework completed? To answer these questions, a case-study approach was chosen to gain an in-depth, up-close, and multi-faceted understanding of ILMx MOOC designs and implementations. We obtained the data through two publicly available online MOOC aggregator websites (the Class Central and MOOC List, in Section 2) and an application document of MOOCs for MASTERS (in Section 3) as well as on the edX Insights with an enrolment (geography/demographics), engagement (course content/course videos) and grading criteria (graded/ungraded submissions) (in Section 4) and a participant's evaluation at the end of every ILMx MOOC with a structured set of questions (based on TUM EvaSys standardized questionnaires, in Section 5). This paper first gives a brief overview of MOOCs in land management. The following section establishes what is special about ILMx MOOC by laying out the development history. Then, we present findings of the research, focusing on the three key themes throughout the ILMx MOOCs. The fifth section includes a discussion of the challenges and opportunities for MOOCs in land management. Finally, the conclusion gives a brief summary and critique of the findings.

2. What are the MOOCs in Land Management?

GIScience scholars started the development of online distance courses in geography since the late 1990s [4], and many GeoMOOCs focusing on geospatial technology are currently available with varying institutions and platforms [8]. Today, attention to e-learning methods and tools have arisen with a growing interest in capacity building in land management for audiences from less-developed countries (LDCs) and countries in transition [9]. MOOCs in land management, in fact, have ambiguous or equivocal meaning since the discipline itself includes varying subjects from policy-related subjects to geospatial technology-related subjects. To ascertain the extent of MOOCs in land management previously or currently offered, we reviewed two MOOCs aggregator websites: The Class Central (www.class-central.com) and MOOC List (www.mooc-list.com). There may be a number of undiscovered MOOCs in land management. In the MOOCs platforms aforementioned, we, thus, checked the results using the following keywords: "land management," "land tenure," "land development," "land administration," "land valuation," "land economics," "land policy," "land readjustment," "land surveying," "geographic information," and "remote sensing." Taken together, we finally selected six MOOCs representing the most relevant registered courses in land management considering offered syllabus on the platforms: *Entrepreneurial Land Redevelopment Approach: Land Readjustment*; *Environmental Challenges: Hierarchy in Property Rights*; *Introduction to Land Management*; *Introduction to Urban Geo-Informatics*; *Landscape governance: Collaborating Across Sectors and Scales* and; *USAID Land Tenure and Property Rights.*

There are two types of MOOCs based upon different learning theories [10]: cMOOCs (*Connectivist* MOOCs) using networks of distributed online resources such as tweets, blogs, and wikis and xMOOCs (*exponential* MOOCs) using structured learning pathways centralized on digital platforms such as Coursera and edX. MOOCs in land management fall into the category of xMOOCs that contains pre-recorded lectures, complete required readings, and discussion forums. We also revealed MOOCs in land management are situated on the platforms within a variety of subjects ranging from engineering, GIS, and business and management to environmental, sustainability, and humanities. All MOOCs are conducted in English and are free of charge. However, in order to receive a verified certificate, a small amount must be paid. Most courses are designed for an introductory level with a self-paced course model and range from 2 weeks to 14 weeks.

Entrepreneurial Land Redevelopment Approach: Land Readjustment is offered by the Massachusetts Institute of Technology (MIT, USA) in cooperation with edX. This course examines and presents processes of designing and implementing land readjustment for urban development in the context of developing countries. The *Environmental Challenges: Hierarchy in Property Rights* course is part of the Environmental Challenges program from the University of Leeds (UK) and provided by the UK-based MOOC provider, FutureLearn. This course explores the different ways that nature is perceived by different types of societies and the impact of property rights on natural resource management. *Introduction to Land Management* from Technical University of Munich (TUM, Germany) shares insights into basic functions and tasks of land management that help global audiences recognize important land correlations with other fields of interest. Anyone can browse through the edX platform and will have an understanding of contemporary global trends and the general process of executing land management interventions. The Hong Kong Polytechnic University delivers *Introduction to Urban Geo-Informatics course via edX* that introduces various geospatial technology and how the technologies help us to retrieve spatial data, and how the geographical data become the information used in decision-making. *Landscape governance: Collaborating Across Sectors and Scales* was designed by Wageningen Centre for Development Innovation, with contributions from the Horn of Africa Regional Centre (HOAREC) in Ethiopia, and South Rift Association of Land Owners (SORALO) in Kenya. This course introduces an integrated and spatial approach and encourages thinking beyond traditional land governance arrangements. *USAID Land Tenure and Property Rights* is an instructor-led course managed by Canvas Network. This course aims at explaining the importance of land tenure and property rights (LTPR)

with critical issues, theories, evidence, and best practices and international development programming. Table 2 provides an overview of MOOCs in land management.

Table 2. An overview of massive open online courses (MOOCs) in land management (compiled and devised by authors).

Courses	Institutions	Platforms	Lengths (Weeks)	Costs	Levels	Subjects	Model
Entrepreneurial Land Redevelopment Approach: Land Readjustment	Massachusetts Institute of Technology, USA	edX	5	Free	Introductory	Engineering/Business and management	Self-paced
Environmental Challenges: Hierarchy in Property Rights	University of Leeds, UK	Future Learn	2	Free	Introductory to intermediate	Environmental science	Scheduled
Introduction to Land Management	Technical University of Munich, Germany	edX	6	Free	Introductory	Environmental science/Engineering	Self-paced
Introduction to Urban Geo-Informatics	Hong Kong Polytechnic University, Hong Kong	edX	6	Free	Introductory	GIS/Engineering	Self-paced
Landscape Governance: Collaborating Across Sectors and Scales	Wageningen University, Netherlands	edX	4	Free	Intermediate	Sustainability/social science	Self-paced
USAID Land Tenure and Property Rights	USAID, USA	Canvas network	14	Free	-	Humanities	Scheduled

Note. Most MOOCs in land management is free of charge. However, in order to receive a verified certificate, a small amount must be paid (from €44 to €88 EUR).

3. Introduction to Land Management (ILMx MOOC): Designing a Course

3.1. Motivation

The Chair of Land Management at TUM delivers different modules in the field of land management for different educational programmes, including geodesy and geo-informatics, environmental planning, environmental engineering, geography and transportation systems engineering, and the international Master's program in Land Management and Land Tenure (LMLT). The latter, especially, attracts students from less-developed countries (LDCs) and countries in transition. The participants in all these separate courses have very heterogeneous backgrounds such as disciplines, previous studies, country of origin, and types of education. All require, however, an introduction into basic concepts, history and aims, and a set of explanatory cases to show the variety of land management implementation tools, options, and instruments. ILMx MOOC, aimed at self-study and general background of the study topic, would bring entry knowledge on par.

3.2. Goals

Currently, each of the disparate modules related to land management lecturers requires some time and effort to bring each of the participants on par and at the same entry level. A comprehensive ILMx MOOC could replace some of this time. This would enable all students to be better prepared, and allow the lectures to go into more depth. In addition, the standardization of lecturing material that will be needed for the preparation of ILMx MOOC can help improve the quality and visibility of the course. Being an international topic, relying on international cases studies and experiences (the Chair is, for example, an active member of the Global Land Tool Network) of the ILMx MOOC will aim to attract international students from Europe, South and Southeast Asia, and Anglophone Africa in particular. In time, the course could be translated in Spanish, French, and/or German to cater for additional students.

3.3. Content Structure

ILMx MOOC consists of six units and the introductory unit. The workload of the unit differs depending on topics. The course is designed by units with different extents including interactive video presentations, additional learning material (videos and literature), exercises, and homework and final exams to receive a certificate. The following units give learners an overview of the content and the suggested workload of each unit.

Unit 1: What on Earth is Land? In this unit, participants discuss the basic definition of land and why land management is needed. Students will get first insight into some key tasks and objectives of land management as well as about different interest groups in the land (four to five hours required).

Unit 2: Who owns the land I live on and the house I live in? This unit discusses the term of land tenure and the meaning of movable and immovable goods. Furthermore, participants will learn about activities connected to land administration such as cadasters and land registers and how mutations of land information take place (three to four hours required).

Unit 3: What is my land worth? In this unit, enrolled students will not only discuss matters such as land valuation and land taxation, but also an experience which factors have an influence on land values and how to determine them (two to three hours required).

Unit 4: How can I manage my land use? This unit covers limitations and requirements of different land uses that provide lectures on the land use planning process and its instruments, as well as about the necessity to include different stakeholders into a planning process (four to five hours required).

Unit 5: Is my land your land? In this unit, key tasks and objectives of land policy will be taught. Learners will experience challenges on different land policy levels and related responsibilities as well as what good and bad land governance mean (three to four hours required).

Unit 6: What are my and your plans with the land? In the last unit, course participants will get to know some typical activities of land management. The course will illustrate some practical examples of land management implementation that highlight the importance of educating professional land manager (two to three hours required).

3.4. Course Assessment

MOOC assessment must rely on either automated means of grading or peer assessment mechanisms, as the number of students who participate is too large for an instructor to grade with manual methods [4]. Assessment of ILMx MOOC took place in multiple ways: summative assessment and formative assessment. There are multiple and single choice exercises, open question, drag and drop exercises, and text input exercises via summative assessment. With these tools, an instant score can be calculated, and automatic feedback can be generated. As a formative assessment, every unit includes one homework activity, which is a text-writing task that can help participants to transfer new land knowledge to their own context. At the same time, other participants have the possibility to disclose more about other countries and experiences in land management. This is implemented in a so-called 'peer assessment' environment that other participants will evaluate other text according to a given writing style and content criteria. Moreover, ILMx MOOC opens up 'discussion forum' that people from different countries, professions, and cultures share their opinion and experiences on land management with each other.

3.5. Development History

Between 2014 and 2018, the Chair of Land Management at TUM and its partners (such as GLTN and GIZ) developed two E-learning tools for capacity improvement for land matters, which differ significantly in content, target-group, and technical implementation [11]: Tenure Responsive Land Use Planning (TR-LUP) tool; ILMx MOOC. The TR-LUP tool, under the agreement on cooperation between UN-Habitat, GIZ, and TUM in 2013, is one of the end-products for implementing the development of a land use planning tool and training package within the programme Global Land Tool Network

(GLTN) [12]. As an autonomous module editing platform, Creyoco—an authoring tool developed by TUM—play an important role in arranging learning content and objects. It is a free open source software and designed for interactive training packages to be completed easily without any previous technical knowledge and massive data transfer [11,13,14]. Alongside developing TR-LUP tool, the first version of ILMx MOOC—as one of the 'MOOC for MASTERS' initiatives at TUM in 2016—was officially released to the public on edX from September 2017 to January 2018. After the first very successful run of ILMx MOOC, the numerous participants and the feedback motivated the chair to start a second revised version of ILMx MOOC (September 2018 to January 2019). The new ILMx MOOC provides additional possibilities for discussion and exchange, better insights through case studies and blogs, as well as new material through additional literature recommendations. For an e-learning tool, it is important to consider target groups and technologies. The main differences between the TR-LUP tool and ILMx MOOC are summarized in Table 3.

Table 3. Differences between the Tenure Responsive Land Use Planning (TR-LUP) tool and ILMx MOOC based on [11].

	TR-LUP Tool	ILMx MOOC
User groups	Experts in land management or related disciplines	Beginners in land management or related disciplines
Objectives	To improve tenure security during a land use planning process	Introduction into the field of land management
Content structures	A text-based online tool with exercises, case studies and literature recommendations with five modules	A video-based online tool with exercises, discussion forum, case studies, and blogs and literature recommendations
Course models	Self-based learning or group training model	Self-based learning model
Platforms	Creyoco (a platform developed by TUM, Germany)	edX (a platform developed by Harvard University and MIT, USA)
Partners	GLTN (UN-Habitat), GIZ, and TUM	TUM
Releases	April 2018	September 2017; September 2018

4. Emerging Patterns in ILMx MOOC: Demography, Geography, and Course Engagement

The edX insights provide the metrics, visualizations, and downloadable .csv files for the student's background and activities enrolled in ILMx MOOC. We reveal three key aspects of emerging patterns on the 1st and 2nd iterations of the course: demography (i.e., how many learners are in the course? How old are learners? What level of education do learners have? What is the learner gender breakdown?); geography (i.e., where are learners from?); and the course engagement (i.e., how many learners are interacting with the course? How are learners interacting with course videos? How are learners doing on course assignments?).

4.1. Demographic Patterns

The first iteration of ILMx MOOC was opened for enrolment on edX from September 2017 to January 2018 and attracted approximately 2800 participants (with 38 verified enrolments) from 160 countries. The second cohort (accessible from September 2018 to January 2019) was successfully completed in 2019 with more than 2000 enrolments (with 26 verified enrolments) in approximately 140 countries. We found that the results from the gender breakdown were lack of female participation (38.5%; 34.6%) in ILMx MOOC.

The midpoint of the learner ages in both courses, computed from the provided year of birth is 31 (1st iteration) and 30 (2nd iteration), respectively. Learners aged from 26 to 40 accounts for more than half of the learners (60.2%; 56.8%) in ILMx MOOC and the learners aged 25 years or under are reported as the second highest proportion (20.0%; 24.3%) but this result was very low compared to the first group. In addition, learners who are better educated and more highly trained (earned Doctorate, Master's or professional degree) are engaged in ILMx MOOC (approximately 35% in the first and second offerings). Table 4 compares the results obtained from learner's self-reported demographic and geographical data from the edX.

Table 4. Learner's self-reported demographic and geographical data from the edX.

	1st Iteration of ILMx MOOC	2nd Iteration of ILMx MOOC
Enrolment	2791	2000
Gender and age		
Male	60.4%	64.9%
Female	38.5%	34.6%
Mean age	31.0 years	30.0 years
Country of residence		
	USA (16.4%)	USA (14.0%)
	India (5.6%)	India (6.4%)
	Germany (5.2%)	Germany (4.5%)
	Nigeria (3.3%)	Philippines (4.2%)
	United Kingdom (3.1%)	Canada (3.3%)
	Canada (3.0%)	Nigeria (2.9%)
	Mexico (2.4%)	Uganda (2.9%)
	Finland (2.4%)	United Kingdom (2.9%)
	Indonesia (2.2%)	Indonesia (2.5%)
	Brazil (2.0%)	Mexico (2.2%)
Education		
High school diploma or less	16.3%	16.7%
College degree	44.0%	46.2%
Advanced degree	37.2%	35.3%

Note. The self-reported results were collected on 17 February 2018 and 2019 in the first and second iterations of ILMx MOOC.

4.2. Geographical Patterns

We recognized that the geographic distribution has remained without large fluctuation between the two iterations of two ILMx MOOC (see Figure 1). The learner's geographic coverage is determined from the IP address where they connected. The same phenomenon was observed that the global audience mostly came from the USA and was followed by India and Germany (or vice versa) in the first and second iterations. Although ILMx MOOC is designed for attracting learners from LDCs and countries in transition, we found that about half of the participated countries enrolled in the 1st ILMx MOOC were more developed countries (MDCs) such as USA, Germany, United Kingdom, Canada, and Finland. In the same vein, the main countries of residence of the second offering not only emerged from MDCs in Europe (Germany and United Kingdom) and North America (USA and Canada) but also LDCs in Africa (Nigeria and Uganda) and Asia (India, Philippines, and Indonesia). With our findings, we assume that the topic of *land management* has been globally recognized as an important *nexus to guide the professionals* in international development studies and practices as well as sustainability research. However, it is always possible that the learner's self-reported demographic dataset would have some statistical discrepancy due to the students who do not provide an answer to some fields.

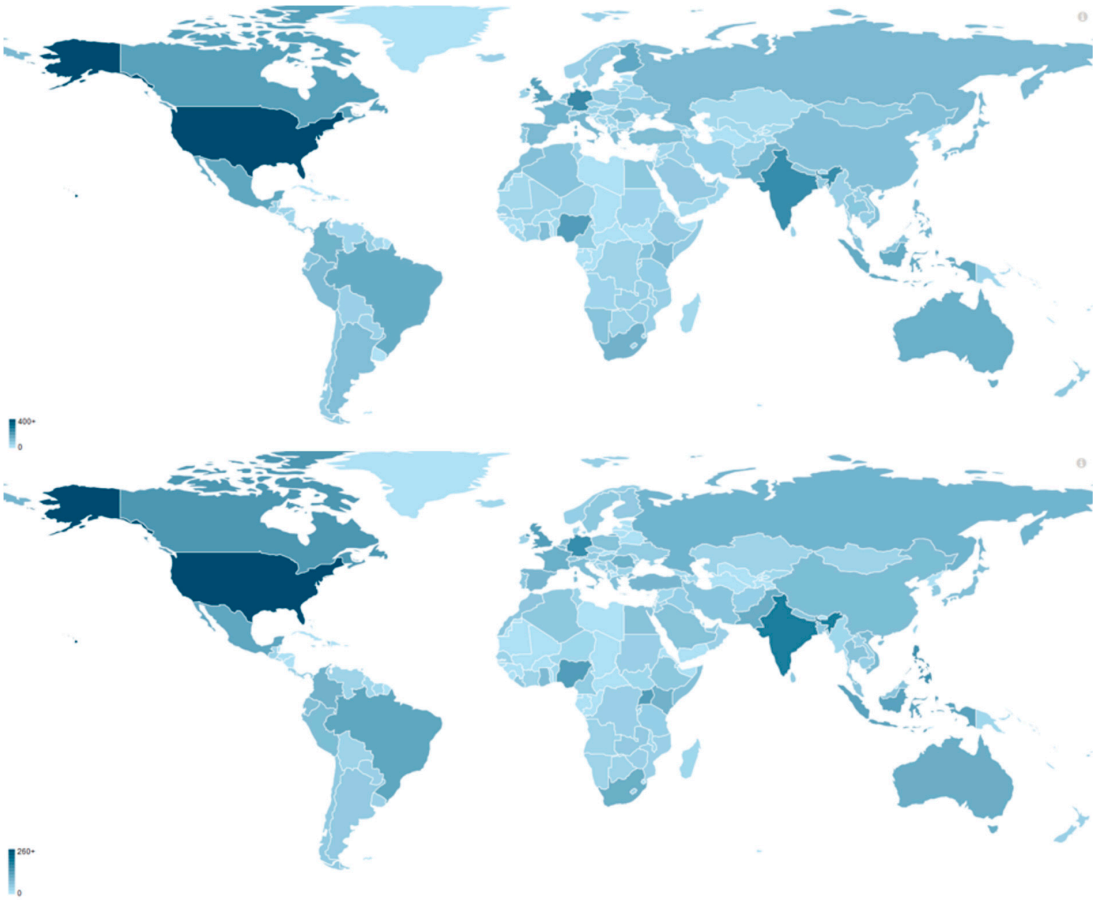

Figure 1. Geographic distribution of students' enrolment in the first (above) and its second (below) iterations of ILMx MOOC (maps are extracted from edX Insights of ILMx MOOC and countries of regions represented on the maps mean that at least one learner enrolled the courses).

4.3. Patterns of Course Engagement

When the 1st course commenced in September 2017, it indicated the highest number of active learners (up to 278 learners) in the first four weeks. This means learners who visited at least one page in the course content. However, the number of learners who played one or more video lectures tends to decrease dramatically and significantly thereafter. Moreover, we found a pattern that the number of learners who submitted an answer for a standard problem and who added a post, response or comment to any course discussion remains at a very low level compared to the previous active engagement. We, thus, assume that the number of enrolments does not represent the number of active learners and the number of learners who engaged in specific activities over time in ILMx MOOC.

For the second iteration of ILMx MOOC, equivalent behavioral patterns of learners were also observed that they participated (their numbers reached up to 404) in the learning process very enthusiastically during the first month of the course. After a month, the engagement of learners participating in page visits, watching videos, or discussing and solving problems declined sharply and since then, the participation rate was consistently low (see Figure 2). This tendency seems to be due to a lack of motivation and interest to induce learners efficiently into the learning content.

In order to overcome this problem, we regularly emailed learners every two weeks to monthly with updates on the course and various news related to land management, but it also failed to become a sustainable solution for the learner's active participation. In the first ILMx MOOC, we also activated the function of the *weekly highlights emails* under the edX platform, which automatically forwarded emails every seven days to inform learners what to expect for the next week. However, this only affected those learners who enrolled in the course after we activated this.

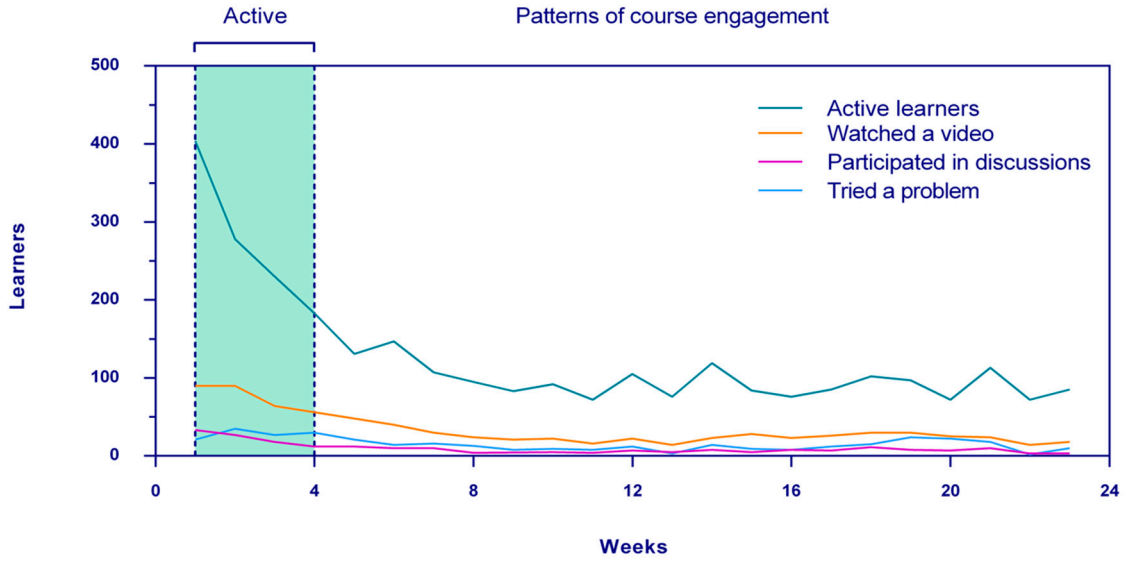

Figure 2. Patterns of learners' course engagement of 2nd ILMx MOOC (devised by authors and data compiled from 10 September 2018 to 18 February 2019).

As discussed in the previous section, deploying both summative and formative assessments alongside video lectures is a strategic choice to evaluate student achievement in ILMx MOOC. These methods included multiple and single choice exercises, open question, drag and drop exercises, and text input exercises, a text-writing task, peer assessment, and discussion forum. Table 5 shows the average number of complete and incomplete views for videos and its completion rates. When it comes to the results in comparing the first and second run of ILMx MOOC, we recognized that most participants merely complete the first two units since we predict they lost all interest completely in continuing the course or did not maintain a steady pace behind. Moreover, the average complete and incomplete views of the first course are about twice as high as the second one. However, the percentage of video viewing completed showed remarkable similarities (approximately 80%) between the two samples.

Table 5. The average number of complete and incomplete views for videos and the completion rates.

Content Structure	Number of Videos		Average Complete Views		Average Incomplete Views		Completion Rates	
	1st run	2nd run	1st run	2nd run	1st run	2nd run	1st run	2nd run
Unit 1	7	7	319.0	158.1	80.6	37.3	79.8%	80.9%
Unit 2	6	6	127.0	49.5	27.3	11.8	82.3%	80.7%
Unit 3	3	3	95.7	41.0	15.3	7.7	86.2%	84.2%
Unit 4	7	7	75.9	34.3	18.7	9.9	80.2%	77.7%
Unit 5	5	5	63.4	31.2	16.0	4.8	79.8%	86.7%
Unit 6	3	3	57.3	26.7	13.3	5.7	81.1%	82.5%

In addition to how many learners interact with course videos, Table 6 indicates the average number of correct and incorrect submissions for questions in the graded and ungraded assignment. What is interesting about the results for us, is that the learners faced difficulties in providing correct answers in the graded course exams rather than the ungraded exercises (e.g., especially unit 2 in graded course assignment) in ILMx MOOC. For instance, the lowest rate of correct submission was 74.6% in the 1st run and 65.3% in the second offering, which is about 20% to 30% lower than the average correct answer rate. We note that the primary reason is deterred from putting more efforts for distribution, depending on the difficulty level of each question, by the course team. For the *open responses assessments* (ORA) of the first version of ILMx MOOC, we had 204 total responses and only 14 peer assessments (by other enrolled learners) were conducted and our course instructors mostly contributed to 168 final

gradings in total. Similarly, the second iteration received 133 open responses and the majority of them reported their results (121 final grade received) by the instructors.

Table 6. The average number of correct and incorrect submissions for questions in the assignment (graded and ungraded).

Assignments	Number of Questions		Average Correct		Average Incorrect		Average Submissions		Percentage Correct	
	1st run	2nd run	1st run	2nd run	1st run	2nd run	1st run	2nd run	1st run	2nd run
Graded										
Unit 1	6	5	37.0	11.2	7.7	4.6	44.7	15.8	82.8%	70.9%
Unit 2	3	3	30.3	10.7	10.3	5.7	40.7	16.3	74.6%	65.3%
Unit 3	1	1	30.0	13.0	8.0	3.0	38.0	16.0	78.9%	81.3%
Unit 4	5	5	31.8	11.6	5.0	4.4	36.8	16.0	86.4%	72.5%
Unit 5	3	3	30.0	10.3	6.3	4.7	36.3	15.0	82.6%	68.9%
Unit 6	1	1	30.0	14.0	6.0	1.0	36.0	15.0	83.3%	93.3%
Ungraded										
Unit 1	14	16	180.2	93.8	19.3	15.1	199.5	108.9	90.3%	86.1%
Unit 2	2	2	141.0	66.0	14.5	1.5	155.5	67.5	90.7%	97.8%
Unit 3	1	1	-	-	-	-	-	-	-	-
Unit 4	7	7	55.9	33.0	13.0	3.0	68.9	36.0	81.1%	91.7%
Unit 5	3	3	63.3	34.0	7.7	0.7	71.0	34.7	89.2%	98.1%
Unit 6	1	1	55.0	30.0	5.0	2.0	60.0	32.0	91.7%	93.8%

5. Reflections and the Way Forward: Sustaining a Culture of Excellence

After the ILMx MOOC completed in 2018 and 2019, we conducted a survey to assess varying aspects of the course divided into the content, discussions, exercises, homework, testing, and its general structure (total 15 questions). The primary aim was to improve and develop the content and its delivery of the course. Although we only collected 16 (out of 2800) and 18 (out of 2000) survey responses in each course and these numbers do not represent the other survey non-respondents' voice, we may be able to evaluate that what was good and what was lacking in the course through a small sample with open answers in detail.

Recently, a considerable literature has grown around MOOCs that accentuate that MOOCs may significantly contribute to democratizing higher education by opening doors to learning and employment opportunities [15–17]. Along with this opportunism, however, results from earlier studies demonstrate that MOOCs can adversely affect educational equity under certain socio-economic and cultural status, confirming that the majority of MOOC learners are young, highly trained males from more developed countries [18–20].

5.1. Gender Disparity

It would be interesting to compare gender disparity of ILMx MOOC with face-to-face higher education within the on-campus courses provided, especially focusing on the Master program of land management and land tenure (LMLT) within the institution (TUM). Despite the high need for the type of professionals which LMLT is generating, the ideal number of students is 15–30 every year. Until 2017, the program had 136 graduates and 28 students (164 in total). The rate of male enrolment is still higher than that of the female. However, the gender difference is gradually closing. Out of the 164 overall enrolments, 100 are male (60.98%) and 64 are female (39.02%). Although this gap comes directly from the number of applications (it is not related to the selection criteria), the program makes a significant effort to close the gap by introducing *Mädchen machen Technik,* emphasizing and researching the role of women in land matters, and paying specific attention to inviting female guest lecturers and experts. Overall, these comparisons support the view that there are similarities of gender breakdown between the ILMx MOOC and LMLT program What is important for us to recognize here is that females' underrepresentation in the on-and-off land management domain (ILMx MOOC and LMLT program) gradually narrows the gender gap over the years.

Although we identified six most related MOOCs in land management in the previous section, there have been no controlled studies including rigorous datasets which compare gender differences in MOOCs in land management. Instead, by drawing on the issue of gender differences in STEM (Science, Technology, Engineering and Mathematics) education in particular, this view is also supported by [20] who note that gender disparity is rampant at STEM MOOCs, as only one in five learners is female (consisting of 20%). In [17] the authors pinpoint that a percentage of female's overall enrolment of STEM MOOCs is considerably lower than males (females: 24.16%), but the completion rate in STEM MOOC is appeared to be equal (females: 3.06%; males: 3.11%). Some probable reasons emerged from this, that females' underrepresentation in STEM MOOC is due to the lack of access to the Internet; gender stereotypes; or inadequate awareness of STEM learning opportunities. We found that the results from the gender breakdown were lack of females' participation (38.5%; 34.6%) in ILMx MOOC. Comparison of the findings in ILMx MOOC with those of STEM MOOCs confirms that the subject of *land management or land management popularization* in digital higher education is likely to attract more females rather than STEM MOOCs.

5.2. Number of Participants (Low Retention Rates)

There have been several studies published on the decrease of MOOC participants/learners (still there is a certain number of "lurkers" and "downloaders" or "silent" participants who download the material and then study it). In a recent study [21], they comprehensively provide the analysis and data (5.63 million learners in 12.67 million course engagements) on existing emerging patterns of MOOCs based on Harvard and MIT via the edX platform from 2012 to 2018. First, the vast majority of MOOC learners never revert to the engaged courses from the first year they joined the MOOC; second, most learners participating in the MOOCs are in the most developed countries in the world; finally, the low completion rates last for the past 6 years (see Figure 3). In other words, although an initial enrolment remains high every registration year, it sharply declines.

We reveal similar patterns of course engagement (numbers) through the 1st (2017–2018) and 2nd iterations (2018–2019) of ILMX MOOC. Second-year retention rates of ILMX MOOC have significantly declined (approximately 28.57%), from 2800 participants from 160 countries to 2000 enrolments from more than 140 countries. A consistency of low retention and recent enrolment declines tends to follow the same pattern, as shown in Figure 3. As indicated, this tendency seems to be due to a lack of motivation and interest to induce learners efficiently into the learning content. Factors thought to be influencing retention rates (or dropouts) have been explored in several MOOC studies [21–25]. A good summary of these factors have been provided by [22]: lack of time, lack of learners' motivation, feelings of isolation and the lack of interactivity in MOOCs, insufficient background knowledge and skills, and finally hidden costs. These findings provide solid evidence and a useful account of how the next ILMx MOOC should consider learners' perception of learning and teaching processes (e.g., accommodating students on different time tables; promoting student completion; enhance peer-to-peer/peer-to-instructor interaction etc.).

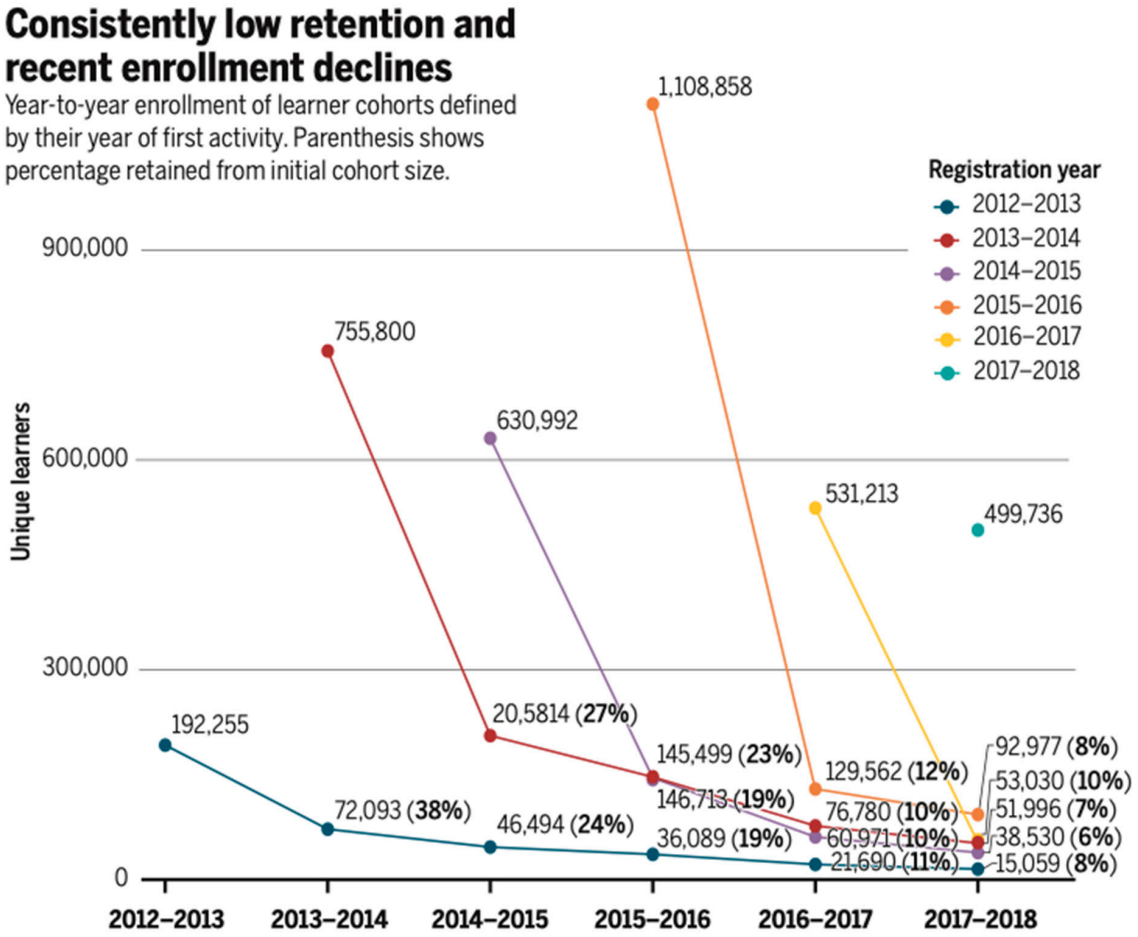

Figure 3. ILMx MOOC has shown a similar pattern of low retention and enrolment declines of MOOCs provided by Harvard and the Massachusetts Institute of Technology (MIT) via the edX platform from 2012 to 2018 (adopted from [21]).

5.3. Global Distribution of Participants

The OPM (Online Program Management) business models are strategically focused on where educationally disadvantaged learners exist (e.g., global south) into the learning platforms rather than existing consumers. According to [21], the correlation between learners' origin and socioeconomic status (SES) and the persistence of enrolments and certification issued has been demonstrated (see Figure 4). The correlation between them was tested using United Nations Human Development Index (HDI) ratings. From 2012 to 2013, 80% of MOOC learners were from countries with high or very high HDI ratings. The rate slightly increased from 2015 to 2016, with most of new registrations and certifications emerging in MDCs than in LDCs.

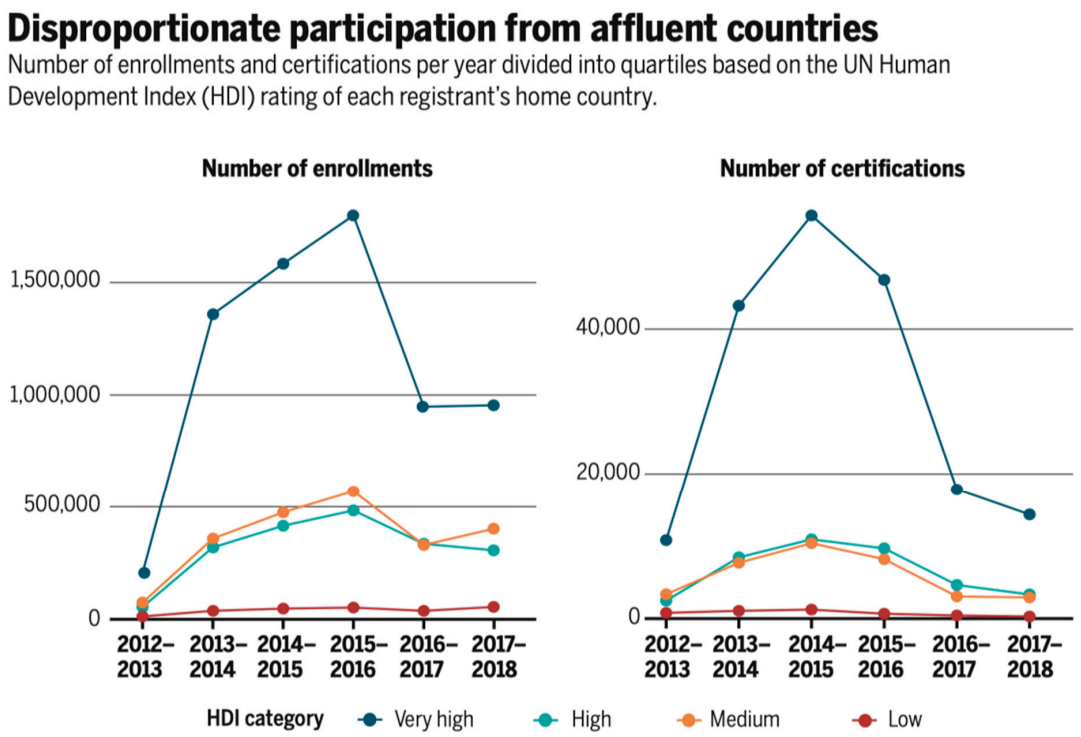

Figure 4. Concentration of enrolments by affluent countries (adopted from [21]).

ILMx MOOC target course-consumers were students from less-developed countries (LDCs) and countries in transition. The data shows, however, the learner's geographic concentration of enrolments in ILMx MOOC has similar patterns, that more than 50% are from affluent countries and neighborhoods, and markers of socioeconomic status. For example, we found that about half of the participant enrolled in the 1st ILMx MOOC were from more developed countries (MDCs) such as USA, Germany, United Kingdom, Canada, and Finland. In the same vein, the main countries of residence of the second offering not only emerged from MDCs including Germany, United Kingdom, USA, and Canada but also LDCs such as Nigeria, Uganda, India, Philippines, and Indonesia. These varying geographical coverages of enrolments and certifications of ILMx MOOC are significantly associated with course design elements (e.g., motivations, goals, content structure, and development history) as well as digital marketing and promotions (e.g., through TUM LMLT alumni clusters in cooperation with international organizations such as UN-Habitat and FIG). Contrary to expectations, we found a slight difference between earlier findings by [21] and our findings. We observed that a slightly more distributed proportion of affluent countries (50%) were among the top 10 countries, compared to an edX average (80%). As compared to common trends, we may assume that the topic of land management stands out, dealing with more global sustainable development related issues such as climate change, food insecurity and food shortages, migration, natural and man-made disasters and conflicts, and land grabbing.

5.4. Critical Reflection

We found that there exist considerable similarities between the learners' ratings of the 1st and 2nd iterations of ILMx MOOC (see Figure 5). In terms of course content, we reveal that learners have shown a high degree of satisfaction with the content offered in six units. ILMx MOOC is designed for an introductory level with a self-paced course model so that learners rated the course correspondingly easy to understand. Maintaining an appropriate balance between text and media as well as theory and exercise led to increasing overall learner satisfaction, motivation, and performance. Nevertheless, we must respond to critics who answer that this course is somewhat abstract and having an issue with the quality of a transcript (e.g., video lectures and written materials) and access on a mobile device. For the discussion forum, the respondents agreed or strongly agreed that scrolling down all the threads to see

what others have posted was not distracting, but interacting with each other about a specific subject was not as effective as they expected, with statements such as "I tried to respond to some folks replies, but I never hear back." People agreed with the fact that the exercise is helpful, but they also found that answers are sometimes duplicated or incorrect and include topics from the recommended readings we provided. Most positive comments were that they inspired awareness of land management problems in their countries or regions throughout the homework. They, on the other hand, also pointed out the lack of interactions among enrolled students for the peer assessments to give-and-take the feedback. In terms of testing, learners tend to more prefer open response assessments (ORA) the same as the homework. More critically, they found the exams are rather complicated and difficult to understand or select correct answers, as well as facing technical issues.

Among the criteria, what learners most liked in ILMx MOOC can be summarized as follows:

Videos are informative combined with text;
Simplicity, brevity, and clarity of terms and key concepts on land management;
Rich real-life examples provided by additional materials;
quick overview and summary notes.

On the other hand, they brought more critical issues and recommendations when considering how the course should improve:

The ambiguity of some answers in the drag and drop exercises;
Different types of homework;
English copy-editing;
More diagrammatic representations;
The incompleteness of hand-outs;
Stimulating interactions among enrolled students and between the learners and instructors;
Including more examples from Europe, North America, and the UK (examples are only focused on developing countries);
Adding other types of videos (e.g., interviews with experts in the field, or portions of workshop discussions dealing with land management issues).

These criticisms and recommendations are clear evidence that we can further curate and sustain a culture of excellence to the global audience and those who are interested, and we believe that ILMx MOOC is the way forward.

One of the most frequently stated problems questioned by many MOOC studies is about the quality of content and the teaching and learning process in MOOCs. In the same vein, what is not yet clear is the role of accreditation with MOOCs that is regarded as a primary means of assuring and improving quality. There are still many unanswered questions about the accreditation [26]: baseline to determine (e.g., curricula, faculty, and student support); necessity of accreditation (e.g., non-credit offerings to mass audience, a peer-to peer or automated assessment and use of data analytics); review elements (e.g., types of accreditations); tools needed (e.g., conversion of college and university credits); and quality review. Meanwhile, there are few initiatives provided by MOOC providers and accreditation agencies (e.g., Coursera protocol; ACE and CHEA in USA; EFQUEL and EADTU in Europe; etc. and see further details in [27]).

Figure 5. A profile line of ILMx MOOC based upon learner evaluations.

5.5. Learning by Doing: MOOCs in Land Management

Education for sustainable development (ESD) is commonly understood as "education that encourages changes in knowledge, skills, values and attitude to enable a more sustainable and just society for all" [28]. ESD consists of two thematic strands: content (labelled holism or holistic approach) and pedagogy (labelled as pluralism) [29,30]. On the one hand, it emphasizes multi-faceted perspectives on content and outcomes (e.g., including environmental, social, and economic dimensions of sustainable development), on the other hand, it reflects the complexity of teaching and learning processes and environment (e.g., adopting learner-centered teaching strategies such as critical thinking, participatory decision making, value-based learning, multi-method approaches, and social learning). Moreover, ESD underlines learning practices which are locally relevant (local priorities), culturally appropriate (context-driven), and globally recognized (global needs) [31]. More recent attention has focused on the provision of socio-technological trends that affect the way of learning, teaching, and understanding knowledge and education (e.g., blockchain, machine learning, MOOCs) [32].

Recent debates on education for sustainable development (ESD) in the field of land management have led to a renewed interest in the effects of disruptive technologies, dealing with varying themes: climate change, biodiversity, sustainable production and consumption, global justice, disaster risk reduction, and poverty reduction [28]. The knowledge boundaries of land management between science and practice are crumbling down due to the advancements in disruptive technologies. Land-related problems (e.g., climate change, food insecurity and food shortages, migration, natural and man-made disasters and conflicts, and land grabbing) are no longer a problem of any single country, region, and person, but are expanding into global, intergovernmental, regional, and community affairs. Thus, to widen knowledge of land management and gain a greater insight into the issues that affect land management not only in one country but also from countries around the world is one of the key agendas. However, a conventional higher education system based on mainly on-campus teaching methods do not adequately meet all the requirements to support multi-dimensional sustainable land management challenges in both science and practices and reach a massive and global audience at present.

The experimental work presented here explores, for the first time, the effects of MOOCs in the land management domain that enable educational institutions and citizens to co-shape and co-produce knowledge and its culture of excellence by providing substantial evidence about demographic (the average number of participants: 2400) and geographic (a variety of countries: 150) patterns. MOOCs is a powerful tool for curating a culture of excellence in land management around the globe, even though MOOCs cannot replace every form of classes in higher education institutions. However, we believe that the culture of excellence in land management shall be supported by 'engaged excellence', which means that the high-quality and rigorous knowledge we produce and accumulate is coupled closely with the extensive engagement with particular countries, localities, and people through practices, partners, and students who have faced land matters [33,34].

One of the critical implications we acknowledge throughout our experiences with MOOCs is how we motivate people those who have different backgrounds (e.g., nationalities, genders, degrees, professions, and reasons for enrolment etc.) in order to participate and complete the course. Moreover, they tend to have different motivations than audiences in traditional courses [35]. In the context of ILMx MOOCs, we made our email communication both informative and beneficial (e.g., providing useful websites; recommended readings and activating the new Dynamic Pacing—weekly content highlight feature on edX etc.) that may encourage learners' active engagement with course content and discursive participation in dealing with land management issues and trends in a forum. We also have categorized motivations for enrolments in ILMx MOOC by reviewing approximately 200 threads of participants' pool in the discussion forum (72 threads in the 1st ILMx MOOC and 114 threads in the 2nd ILMx MOOC). The most common causes for enrolment in ILMx MOOCs were investigated to gain insight (knowledge) into the fundamentals of land management and to share experiences and best practices in land management globally; and fulfilling their current and future needs (e.g., preparing for their advanced studies and further develop their professional depth in land management).

To communicate effectively with more than 2000 learners, we need to put more efforts in designing, developing, and teaching MOOCs. More practically, a weekly Q&A session using social network services (e.g., Facebook; Twitter; LinkedIn etc.) and a monthly live video session for further discussion between instructors and learners will stimulate and motivate learners' interest. However, these also require substantial time and heavy workloads that engage instructors with ORA, assignments, assessments, and discussions alongside their on-campus teaching.

When we examine the profiles of enrolled students in ILMx MOOCs, we found that they hold varying professional careers in land sectors over the world: civil engineers, economists (e.g., land, environmental and development), urban planners, lawyers, natural resource managers, land surveyors, geographers, geologists, journalists, government officers, humanitarian agencies, lecturers (professors), architects, farmers etc. We, therefore, note that MOOCs in land management not only attract students of land management and land tenure, but also those who have academic backgrounds of geodesy, civil engineering, transportation engineering, geography, environmental engineering, environmental planning, politics, public administration (governance), urban, regional, and spatial planning. Moreover, international professionals especially working in the fields of land management, land tenure, land law, land administration, land economics, land development can be targeted groups for MOOCs in land management. When designing, developing, and teaching MOOCs in land management (e.g., curriculum co-development; country-specific case study experts' interviews; staff exchanges for co-teaching and co-research) in cooperation with multilateral and bilateral agencies active in the field of land management (e.g., UN-Habitat, GLTN, GIZ), the course should be made to be easy to deliver global land management challenges and international agendas such as Sustainable Development Goals (SDGs).

6. Conclusions

This paper has elaborated the course design, emerging patterns of ILMx MOOC, and its implications in MOOCs in land management. We developed the course for potential entrants to the land management domain, or for those who simply want to become aware of land-related challenges and brought together with thousands of participants worldwide with freely accessible course content and rooms for open discussion. ILMx MOOC has introduced a global audience to the basic concepts of land management and answered the critical questions of why land management is needed, and which instruments exist to manage land. This course does not only address the basic functions and tasks of land managers, but also highlights the importance of educating experts in land management. With our experiences, we found that the subject of land management in digital higher education affects gender gaps in enrolments. We also assume that the topic of land management has been globally recognized as an important nexus to guide professionals in international development studies and practices as well as sustainability research. However, equivalent behavioral patterns of learners were also observed, in that they participated in the learning process very enthusiastically only during the first month of the course and this seems to be due to lack of motivation and interest to induce learners efficiently into the learning content.

According to Bokor [36], the higher education institutions in the world have more engagement with MOOCs for various reasons: defensive mechanisms for changes in e-learning environment, preemptive means to accommodate the leading position of e-learning, a marketing channel for payable and international students, enriching and transforming classrooms (e.g., to provide blended learning; flipped classroom), lowering education expenses and reducing teaching costs, and strengthening research capacity in e-learning and MOOCs. Through MOOCs, TUM also aims to cultivate in global learners the creativity, passion, and technical competence needed to tackle the crucial challenges of our time. We believe that e-learning and MOOCs is a strategic choice for land management communities that provide an additional means of marketing and building capacity globally. With the MOOCs in land management, there can be more attention to the subject of land management, and a broader

window of opportunities to translate from MOOCs to paying students on campus and to develop innovative tools for training disadvantaged groups (e.g., global south).

What makes MOOCs in land management distinctive is that all learners have the opportunity to engage with varying land management issues from around the world from a better and wider standpoint. The culture of excellence in land management is not to infuse learners with our knowledge of land management. Instead, we provide a smart and responsible sharing knowledge platform for the land management communities, and MOOCs in land management is regarded as an essential component in building the cluster of land management activities in higher education institutions with producing new knowledge of land management. This shall be becoming a culture engaged by a group of people or community in land management in creating the culture of excellence.

Digital learning is not a goal in itself, but needs to fit in a general strategy and mandate of universities—it has to be part of life-long learning options. Some of the staff will need a completely new teaching capacity development. A closer link to industry and practice will be needed in order to test new formats and receive recognition and accreditation of the new learning formats. In a digital learning environment, students are assumed to be more independent, but can also contribute directly to improvements, assessments of quality. In such an environment, there is more need for experimentation, testing and sharing experiences. This must be part of strategic choices within an organization developing and providing courseware. Shifting to new forms of teaching requires testing, practicing, and experimentation—not all things work immediately. Staff must be given time and space to experiment and learn from mistakes. Funds need to be allocated structurally. In addition, there has to be a culture of learning from each other, testing pilots together, and sharing experiences. As a consequence, in the short term, it is recommended to opt for tests and experiments, collaborate where possible, and make strategic choices where you can benefit immediately from one or the other digital teaching and learning forms. In the long term, one needs to obtain green light and structural funding from politics, connect digital learning to digital marketing strategies, and use analytics to measure the effects and implications of the new learning activities. This does not go without major hurdles to overcome. The learning curve for both lecturers and learners may change, expectations will start to vary, and maintaining sufficient motivation may still prove a major bottleneck. Last but not least, accreditation of educational programs using MOOCs and other digital courseware may still prove an administrative difficulty.

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