

# Are MOOCs a Good Strategy for Democratizing Access to Health Knowledge? Insights from an Implementation Evaluation

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## Research

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## Abstract

**Background:** Offering widespread access to training, massive open online courses (MOOCs) are regarded in the literature as a tool for democratizing knowledge. However, to be universal they must be culturally contextualized and have access to broadband Internet with adequate connectivity. Aiming to strengthen capacities in low- and middle-income countries, the SDH-Net multicenter consortium created a 10-hour MOOC specifically designed to enhance understanding of the social determinants of health (SDH).

**Methods:** This is crucial for tackling health inequalities through public policy. Using a mixed methods approach, we evaluated the implementation of the SDH-Net MOOC from the perspective of e-literacy, Internet connectivity, course contents and instructional design: we administered a questionnaire to a pilot group of 29 course participants from Brazil, Colombia, Kenya, Mexico, South Africa and Tanzania, and conducted semi-structured interviews with a subset of 15 individuals who had completed the course.

**Results:** While participants in general considered the content of the course adequate, those who were not English speakers found certain instructions somewhat unclear and 55% of respondents experienced difficulties with Internet connectivity and speed. Therefore, a key finding of this study was that binomial e-literacy-technological access play a major role in enrollment in, and completion of MOOCs.

**Conclusions:** Course design is reflected in all course elements, such as the definition of competencies, instructional objectives, learning activities using multimedia resources and evaluations for each thematic unit, and these are central to the acceptability and effectiveness of MOOCs. These results shed light on the discussion regarding the function of MOOCs as a tool for democratizing knowledge and cast doubts on their usefulness in mainstreaming global health knowledge.

## Background

Massive open online courses (MOOCs) have been proposed as an alternative for eliminating geographical, time and cost barriers to the acquisition of new knowledge, skills, and training. MOOCs are self-directed, automated resources available to anyone which provide academic credits through learning activities and evaluations. They are distributed through Internet platforms and respond to the needs of large numbers of users/students interacting simultaneously [1]. MOOCs have become an efficient way of responding to the need for continuous education and professional training throughout the life course.

MOOCs have thus been set forth as a tool for democratizing knowledge insofar as they offer free and massive access to learning for those who need to update their knowledge and skills, specialize in a given field or achieve higher educational levels through technology [2]. It has been suggested that the democratizing function of MOOCs is based on three access-driven principles, namely access to education for all, particularly for those who face limitations in attaining conventional schooling; to Internet connectivity and e-literacy; and to services with a homogeneous pedagogical design [3].

Notwithstanding their apparent benefits for all, the success of MOOCs poses many challenges. For example, completion rates rarely exceed 10% of enrollment [4] and access to broadband Internet that varies significantly among countries and individuals. It is noteworthy that, in most low- and middle-income countries (LMICs), access to broadband Internet is available only at a high cost for the average citizen and predominantly in urban zones [5]. Consequently, the only individuals who can aspire to gain knowledge or develop professional skills through MOOCs are those who own or have access to adequate computer equipment and contract broadband Internet services, or those who have access to a place with Internet (paying for it).

Also, many of the specialized programs offered by MOOCs are in English, which makes access to the original language of these courses is unaffordable for many. According to the literature, for education to be universal, it must be contextualized in the real world and focused on local needs, meaning that course contents need to be adapted to the diverse cultural contexts and social realities of users [3, 6].

Poy & Gonzalez-Aguilar [2] argue that MOOCs maintain and even increase the gap among individuals who command the necessary financial resources to pay for broadband Internet, speak English and are advanced users of Information and Communication Technologies (ICTs). These conditions would seem to undermine the democratizing function of MOOCs, which rests on the delivery of universal information and training free of charge [2, 3, 6].

This article aims to present the results of our study evaluating the implementation of a MOOC designed to build and strengthen Social Determinants of Health (SDH) related capacities in LMICs. Increasing health literacy among professionals from different disciplines is key to implementing the SDH approach against health disparities. Developing these skills is particularly relevant among LMICs, many of which are barely starting to direct their actions, strategies, policies and programs towards achieving equality in health [7]. The MOOC we analyzed was developed by SDH-Net as part of a multinational project aimed at strengthening SDH-related capacities globally, reaching a wider audience beyond public health practitioners [7]. The purpose of our work was to determine whether the SDH-Net MOOC may be considered a democratizing tool for bridging gaps in SDH knowledge and skills among professionals living and working in LMICs.

This MOOC was fully automated, self-directed, and free of charge. With a duration of ten hours (including time for reading the required materials), this course is currently available at the following educational platform: <http://tie.inspvirtual.mx/portales/sdhnet/essentials.php>.

## Methods

### Study Design and Material

We used a mixed methods approach to evaluate the implementation of the MOOC, "The Essentials of SDH" [8, 9] and focused our work on identifying course barriers and facilitators as perceived by the students. For data collection, we administered a survey questionnaire and conducted semi-structured interviews

with the students. Evaluation took place once participants had completed all course activities, four weeks after kickoff. Our objective was to obtain information from the students regarding their:

1. level of computer proficiency (e-literacy) and interaction with implementation;
2. perceptions of the barriers and facilitators related to internet connectivity;
3. perceptions of the course contents from the viewpoint of quality, relevance, and pertinence to different realities; and
4. perceptions of the instructional design of the course (activities, exercises and materials provided)

## Target Population

Participants were college and graduate students of both sexes who had voluntarily enrolled in the course. All students had been invited by six African and Latin American institutions among a total of eleven SDH-Net consortium members participating in the multinational SDH capacity-building project [10]. The following inclusion criteria were adopted: educational level equivalent to a bachelor's or technical career degree, having completed the course, and having agreed to participate in our evaluation. For the qualitative component, age was considered a fundamental variable regarding e-literacy skills individuals both under and over 40 years of age were considered.

## Procedures and Instruments

For the both components, we designed instruments that would allow us to explore the four dimensions of the theoretical model proposed by Pei-Chen, Tsai, Glenn, Yueh-Yang & Dowming [11]: the computer skills of students and the way they interact with the course; the role of Internet connectivity in implementation; barriers and facilitators related to the contents; and barriers and facilitators related to the materials, tools and instructional design of the course.

For the quantitative component, we sent all students who had completed the course and obtained the corresponding certificate, an invitation to participate in our evaluation along with a questionnaire. For this purpose, we used the SurveyMonkey platform. The questionnaire contained 30 items grouped into the four previously mentioned dimensions; each item was evaluated according to a five-point Likert scale where 1 denoted strong disagreement and 5 strong agreement. We performed a descriptive analysis of the results based on similarities and differences in country and age, assuming that Internet connectivity was related to the countries' level of development, and age to the e-literacy of the students.

For the qualitative component, we conducted semi-structured interviews with the students to explore their perceptions on barriers and facilitators in the four above-mentioned dimensions. With an average duration of 20 minutes each, the interviews were conducted in English, via Skype, by prior appointment. The interviewer was a bilingual female researcher with doctoral-level education and experience in qualitative methods. All interviewees received an informed consent form by email. Socio-demographic information regarding age, sex and schooling was collected from respondents. Each interview was audio recorded and transcribed.

To analyze the interviews, we used a matrix of results [12, 13] based on the following code families: (a) student e-literacy, (b) Internet connectivity, (c) course contents, and (d) instructional design. Our coding catalog followed the theoretical model proposed by Pei-Chen et al. [11].

Finally, we performed a thematic analysis to identify the most relevant themes. These were established based on the data patterns that contributed meaningfully to our understanding of the course dimensions under evaluation [14, 15].

## Study Sample

We employed a mixed methods approach and followed a convenience and sequential sampling process [16]. Participants were from Brazil, Colombia, Kenya, Mexico, South Africa, and Tanzania. The qualitative sub-sample was derived from the quantitative sample.

Data were collected over a period of 15 days. After submitting the emailed questionnaires, the students were invited to an interview for a qualitative evaluation of the course.

Of the 59 students who were invited to take the course and participate in our evaluation, 43 (72%) actually enrolled in the course, 37 (63%) completed it, 29 (50%) answered the survey questionnaire and a final sample of 15 (25%) agreed to be interviewed.

## Validity and reliability

The questionnaire and interview guide had face validity and had been tested with respondents in Costa Rica and Mexico prior to their application in our evaluation. We compared and contrasted the quantitative and qualitative data collected using triangulation techniques [8]. Two independent researchers interpreted the mixed results analyzing the same data and reaching consistent conclusions [17].

## Ethical Considerations

The protocol for our general research project was approved by the Ethics Review Board of the National Institute of Public Health in Mexico. All participants took part in the study voluntarily after providing oral informed consent and were assured that their information would be treated confidentially. None were offered any incentives.

## Results

## Participant Characteristics

Those who completed the questionnaire and participated in the interviews were mostly women under 40 years with a graduate degree. Table 1 describes the general socio-demographic characteristics of participants.

Table 1  
Sociodemographic characteristics of the participants by component

Sociodemographic characteristics of the participants	Component	
	Quantitative (Questionnaire)	Qualitative (Interview)
<b>N</b>	<b>29</b>	<b>15</b>
<b>Sex</b>	1 (3%)	4 (27%)
Men		
Women	28 (97%)	11 (73%)
<b>Age</b>		
< 40 years old	22 (76%)	10 (66%)
>40 years old	7 (24%)	3 (33%)
<b>Educational Degree</b>		
Bachelors	6 (21%)	0 (0.0%)
Graduate	23 (79%)	15 (100%)
<b>Country</b>		
Brazil	2 (7%)	2 (13%)
Colombia	6 (21%)	4 (27%)
Kenya	7 (24%)	2 (13%)
Mexico	8 (27%)	4 (27%)
South Africa	2 (7%)	1 (7%)
Tanzania	4 (14%)	2 (13%)

## Computer Skills And Interaction Of Participants With Course Implementation

The e-literacy skills of participants were adequate. When running virtual courses such as the SDH-Net MOOC it is very important to evaluate the computer skills of the students and to ascertain how they perceive their own performance in using a computer; these conditions form part of to the students' learning domain. All participants in our study stated that they had advanced computer skills, felt comfortable taking an online course and possessed the necessary e-literacy level to achieve the course objectives. Of the total number of participants in the quantitative component, only one person who was older than 40 stated that he/she found it difficult and stressful to work with computers. Nearly all respondents (93%) strongly disagreed with the following statement: "Working with computers is only for young people," while 83% agreed or strongly agreed with the following statement: "Working with computers will make me more productive in my job," and 90% strongly disagreed with the following statement: "working with computers is very difficult." Regarding the qualitative interviews, all participants confirmed that they had confidence in their e-literacy skills.

### Perceptions of users regarding barriers and facilitators related to Internet connectivity

The length of time required to complete the course was related to Internet connectivity. While all participants self-reported that they had advanced-level computer skills, they also stated that they were significantly affected by structural problems related to limitations using the Internet such as Internet connectivity and speed. For instance, 55% reported experiencing difficulties during the course related to technological failures, such as problems of connectivity and inadequate Internet speed for playing and downloading the videos. When analyzing the data by country, we observed that participants from South Africa (100%) and Tanzania (50%) strongly disagreed with the affirmation, "I feel satisfied with the internet speed" as compared to those from Colombia (17%) and Mexico (12%).

Therefore, while some participants mentioned that it took them three hours, others reported needing up to 30 hours. One notable finding was that most of those completing the course in ten hours or less stated that they were familiar with the concepts found in the course readings. On the other hand, those requiring up to 30 hours reported encountering many problems of Internet connectivity which caused problems in downloading activities.

"I didn't have any problem resolving them [technical difficulties], but I did have problems with the Internet connection." (F4, Tanzania, 34 years old)

"I couldn't download the city map activity. I had to reload the page twice." (F15, Brazil, 26 years old)

"The city map took a lot to download. Evaluations are appropriate but some information was not evaluated." (F9, South Africa, 27 years old)

## Perceptions Of Users Regarding Course Contents

Contents were comprehensive, but to include more contextualized examples was suggested. Most participants (97%) agreed or strongly agreed with the statement, "Using this web-based learning system would improve my learning performance in existing courses on SDH and related topics"; 80% agreed with the sentence, "I feel that this course served my needs well"; 90% of participants reported feeling satisfied or strongly satisfied with the course contents and 100% would recommend this course to others. A notable finding from the qualitative component was that participants identified the universality of the course as one of its advantages since it was adapted to the Latin American and African contexts. However, some participants suggested the need to offer more examples incorporating Latin American circumstances.

"It is well related to the academic and private sectors. It is pretty universal, and it works for the Latin American context." (M12, Mexico, 27 years old)

"Yes, we have some of these problems [SDH problems] in Brazil. The contents are fully contextualized." (F14, Brazil, 31 years old)

"[The contents] are very well related to context but need more Latin American examples." (F8, Colombia, 45 years old)

### Perceptions of users regarding the instructional design of the course

Materials were well designed but understanding the course evaluations posed difficulties. More than 85% of participants agreed or strongly agreed that the materials designed for the SDH-Net MOOC were very easy to use; the perception was the same regarding the overall course design. Results were consistent across countries and age groups. Reviews were generally very favorable, with 96% of respondents agreeing or strongly agreeing with the expression "Using this web-based learning system would improve my learning", and 90% agreeing or strongly agreeing with the statement that "Using this web-based learning system would enhance my productivity in general". Participants preferred videos over other materials, nevertheless, some participants reported difficulties related to connectivity during implementation which interfered with downloading the videos:

"Many things are said about SDH, but we have no idea how severe the situation is ...the videos [help to] illustrate and contextualize things very well." (F14, Brazil, 31 years old)

"[Videos] They are OK, but I couldn't download most of them." (F3, Tanzania, 35 years old)

"[The] videos were good, but I wasn't able to download them correctly." (F4, Tanzania, 34 years old).

Some participants perceived an imbalance in the number of readings for each module and complained that the time required for some modules was excessive:

"The course needs more balance. There are too many readings [in some modules]. It took me two hours to do the first module plus six hours to do the second." (F4, Tanzania, 34 years old)

"The course would take more than 10 hours if all exercises and readings were done." (F10, Mexico, 46 years old)

Most participants (90%) agreed or strongly agreed with the statement "The page layout and the design of this course were easy to use", and 70% agreed or strongly agreed with the statement "This e-learning course offered a good range of activities for assessing my learning."

Finally, most participants felt that instructions for completing all course activities were sufficient, and 65% agreed with the statement "The course instructions were enough to complete all the activities".

As for the platform design, many users, particularly those from non-English-speaking countries, stated in the interviews that course quizzes, evaluations, and activities were unclear. They reported a lack of clarity in the instructions.

"The second evaluation isn't clear, and changes aren't allowed. The buttons in the third evaluation are confusing." (F6, Colombia, 26 years old)

"The city map activity wasn't clear." (F15, Brazil, 26 years old)

"[The instructions] were clear, but they need to allow you to go back and restart some activities." (F2, Kenya, 27 years old)

Table 2 summarizes the mixed method results showing both quantitative and qualitative results.

Table 2  
Mixed Method Results

Category	Quantitative		Qualitative
	Strongly agree / Agree	Strongly disagree / Disagree	
<b>1. E-literacy</b>			
<i>Working with computers is very difficult.</i>		90%	<i>The e-literacy skills of participants were adequate.</i>
<i>Working with computers is only for young people.</i>		93%	
<i>Working with computers will make me more productive in my job.</i>	83%		
<b>2. Internet Connection</b>			
<i>I experienced difficulties related to technology.</i>	55%		<i>The length of time required to complete the course was related to Internet connectivity.</i>
<i>I feel satisfied with the Internet speed.</i>			
South Africa		100%	
Tanzania		50%	
Brazil	100%		
Kenya	100%		
Colombia		17%	
Mexico		12%	
<b>3. Course Content</b>			
<i>Using this web-based learning system would improve my learning performance in existing courses on SDH and related topics.</i>	97%		<i>Contents were comprehensive, but the need to include more contextualized examples was suggested.</i>
<i>I feel that this course served my needs well.</i>	90%		
<i>I would recommend this course to others.</i>	100%		
<b>4. Instructional Design</b>			
<i>Materials designed for the MOOC, "The Essentials of SDH," were very easy to use.</i>	85%		<i>Materials were well designed, videos were strongly preferred over readings, and understanding course evaluations posed difficulties.</i>
<i>Using this web-based learning system would improve my learning.</i>	96%		
<i>Using this web-based learning system would enhance my productivity in general.</i>	90%		
<i>The course instructions were enough to complete all the activities.</i>	65%		
<i>The page layout and the design of this course were easy to use.</i>	90%		
<i>This e-learning course offered a good range of activities for assessing my learning.</i>	70%		
<i>The course instructions were enough to complete all the activities.</i>	65%		
<i>Source: elaborated by the author</i>			

## Discussion

A key finding of this study was that binomial e-literacy-technological access (Internet connectivity and speed) play a major role in enrollment in, and completion of, MOOCs [2, 3].

Our evaluation revealed that Internet connectivity was unequal and was related to the level of development in the host countries. Data on Internet costs in the participants' countries reveal substantial disparities. While broadband connectivity in Brazil is available to 59.07% of the population at an average monthly cost of \$34.2 USD, in Tanzania it is available to only 5.4% of its inhabitants at \$115.2 USD a month [18]. This confirms that the availability and cost of Internet connectivity may be a significant access barrier to utilizing MOOCs.

Structural barriers deepen the gaps in access mainly as a result of technological limitations, as reported in the literature [2, 3]. This, together with a lack of pedagogical models for sustaining the instructional design of the MOOCs, may explain their high dropout rate [4, 19].

Our findings revealed that the instructional design was among the key factors facilitating the implementation of the SDH-Net MOOC and the strengthening of SDH capacities among participants. This design is reflected in all course elements, such as the definition of competencies, instructional objectives, learning activities using multimedia resources and evaluations for each thematic unit; these are central to the acceptability and effectiveness of MOOCs. Multimedia resources, videos and a variety of pedagogical materials were perceived as being more effective for learning in a short period of time than were the readings; this was especially true among participants reading materials in English when this was not their native language. Participants from Brazil, Colombia and Mexico also reported problems understanding instructions for exercises and tests. Our evaluation therefore suggests that interactive learning activities (including videos) are more effective than readings in assuring the successful implementation of MOOCs, notwithstanding the challenge of downloading videos in contexts where Internet connectivity is poor.

Our evaluation also suggests the pertinence of testing MOOCs with potential users, especially those whose native language is not the same as that of the MOOC, and points to the importance of crafting a careful platform design as it relates to the instructional model in ensuring successful implementation of MOOCs [2, 11].

Although participants perceived the contents of the SDH-Net MOOC to be universal, we identified access barriers such as limitations in Internet availability and choice of language. These obstacles perpetuate and even deepen the gaps between those who have access to resources versus those who do not, as has been reported in the literature [3]. This finding suggests the need to design courses that do not require daily access to the Internet and that are available in the native language of users.

The evidence presented in our study can help inform the debate concerning the function of MOOCs as a tool for democratizing learning about global health. Our results suggest that MOOCs may fail to reduce the knowledge gap if the detected barriers are not tackled in the instructional design of the course. Further analysis has led us to think that, contrary to expectations, MOOCs might not only be reproducing, but actually increasing the existing disparities in educational gaps, by benefiting those individuals with greater personal resources (education, income and knowledge of a second language), institutional resources (access to educational institutions) and the ability to comprehend and utilize the ICTs, when compared to those lacking such resources [2].

Finally, given the considerable investment made by governments [20] and universities [6] for the development and implementation of MOOCs as a way of reducing social inequalities, our study highlights the need to evaluate MOOCs using a mixed method approach in order to assess whether or not their use is effective and efficient as a tool for democratizing knowledge and, thus, whether or not public expenditure to develop them can be justified.

One possible way of overcoming the barriers facing MOOCs in truly becoming a tool that facilitates democratic and equitable access to knowledge for development is to adapt them to the technical limitations of the places where they are to be implemented. Likewise, translation into languages other than their original language could help non-native speakers benefit from these types of resources.

### **Study limitations**

The interviews for the qualitative evaluation were conducted through Skype, therefore some were affected by interruptions and a lack of fidelity. However, these problems did not seem to undermine the quality of the information.

Participants in the evaluation were related in some way to SDH-Net consortium institutions. Hence, belonging to such institutions might have made them feel more committed to taking and passing the course, which was reflected in a very high completion rate (86%) compared to what is reported in the literature (15%) [4]. However, this evaluation did not seek to assess the course completion rate.

## **Abbreviations**

MOOCs  
Massive open online courses  
SDH  
Social determinants of health  
ICTs  
Information and Communication Technologies  
LMICs  
low- and middle-income countries

## **Declarations**

### **Ethical Considerations**

The protocol for our general research project was approved by the Ethics Review Board of the National Institute of Public Health in Mexico. All participants took part in the study voluntarily after providing oral informed consent and were assured that their information would be treated confidentially. None were offered any incentives.

### **Consent for publication**

Not applicable

### **Availability of data and materials**

The datasets generated and analyzed during the current study are not publicly available due to participants' privacy concerns, but some may be available from the corresponding author on reasonable request.

### Competing interests

**The authors declare that they have no competing interests.**

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### Authors' contributions

PT, GG and VN designed the study; IE worked on the qualitative data, PT and IE analyzed and interpreted qualitative data; PT and GG worked on the quantitative analysis. All authors were a major contributor in writing the manuscript. All authors read and approved the final manuscript.

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