



## MOOCs, an innovative alternative to teach first aid and emergency treatment: A practical study



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### ABSTRACT

The fast and constant evolution of Massive Open Online Courses (MOOCs) has gained the attention of the educational community, achieving widespread popularity among many universities. However, there is very little research on the use and acceptance of MOOCs by students in disciplines such as health and medicine. The principal focus of this study is to explore the behavior of students from a MOOC on Health Emergencies, analyzing the completion and drop-out rates. The data were collected from three self-administered questionnaires; the first identified general demographic information and the students' learning preferences, the second determined the level of MOOC adoption and the level of identification and satisfaction the students had with the course content, and the third measured the completion and drop-out rates. The MOOC had more than 2114 registered participants. The enrolled students showed high levels of commitment and motivation to learn about this topic through a varied of innovative educational resources, such as videos, learning activities, and interactive animations. In general, the participants expressed their desire to continue learning with this type of methodology. However, the results also showed important issues to be considered in the design and development of a MOOC of these characteristics.

### 1. Introduction

According to Morgans and Burgess (2011), a health emergency is any condition that may result in death, permanent disability, or severe physiological discomfort or distress. Some examples of health emergencies are chest pain, difficulty breathing, stroke, bleeding, and vision loss, among others. The immediate and adequate identification of these type of emergencies, with the goal to give the patient first aid treatment, are of vital importance to keep the patient alive until medical services arrive (Avalere Health LLC, 2015). The Warwick University found that one in eight cardiac arrest victims die because of poor cardiopulmonary resuscitation. Every year, thousands of people die because no one around them knows how to perform life-saving CPR when an emergency occurs; they don't have the confidence and skills to do it, because they haven't learned about first aid (Saba and Riley, 1997). In this regard, it is essential to promote the development of education and training of healthcare professionals and the general public.

Currently, there are many options to gain this type of knowledge and training, such as face-to-face courses, virtual courses, workshops, and video tutorials. However, MOOCs are an emerging trend in online

learning, offering a flexible and cost-effective method of providing high-quality education to large numbers of students from all over the world (Morales et al., 2018). MOOCs, in comparison with traditional classroom courses, provide the opportunity to learn anywhere, anytime; they are open-access and lack prerequisites to enroll, meaning anyone can register and participate. In the literature, two distinct pedagogical forms of MOOC have been discussed—cMOOC and xMOOC—. cMOOCs are based in a connectivism theory; this type of course is built around social and collaborative activities and joint projects (Rodriguez, 2013). xMOOCs, on the other hand, are based on a behaviorist theory; this type of course is more traditional classroom structure, integrate short video lectures and are complemented by readings, learning activities, tests, and forums in which student discuss content and solve problems with their peers. Stanford, Coursera, edX and Udacity promote this type of MOOCs (Yousef et al., 2014).

Some educational institutions doubt that such practical topics as healthcare and medicine can be taught through MOOC methodology, but evidence shared by Liyanagunawardena and Williams (2014) proves otherwise. In 2013, 98 health and medicine-related MOOCs were offered; 57 of these courses were deployed on the Coursera

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platform, 92 MOOCs were offered in English, 4 in Spanish, and one was offered in Arabic and in Chinese. Four years later, [Shah \(2017\)](#) evidence that the proportion of health- and medicine-related courses offered in 2017 was greater than in areas such as engineering, art and design, and mathematics.

[Mehta et al. \(2013\)](#) envisioned MOOCs as key facilitators of competency-based, learner-centered medical education that can better meet the needs of societies and their changing healthcare systems. [Prober and Khan \(2013\)](#) argued that several key strategic factors are driving the need to reimagine medical education in such a way that online learning would facilitate evidence-based teaching and would take advantage of the benefits of a flipped-classroom at a low cost; it would even open the possibility of sharing curricula across medical schools.

Considering the above-mentioned, the central research questions (RQs) of this work are presented as follows:

Q1: Has the course been a useful learning experience for students?

Q2: In relation to drop-out rate, what are the main personal and academic reasons for dropping out of the MOOC?

The present article addresses the experience of designing and conducting the MOOC “Health Emergencies” with the objective of analyzing the behavior of students to determine the level of MOOC adoption and to identify the participant's satisfaction with the educational resources developed and implemented, discussing the opportunities and challenges related to development of a MOOC with the health and medicine teaching field. This strengthens the studies that have been carried out to learning opportunities through MOOCs ([Liyaganawardena and Williams, 2014](#)).

This paper is organized as follows. [Section 2](#) contains a literature review focusing on the progress and evolution of the MOOCs field. In [Section 3](#), the procedure description, design, and technological aspects implemented in the course are introduced. [Section 4](#), described the research methodology used. [Section 5](#) presents the learner behaviour analysis and the completion and drop-out rates, and finally, this work concludes with the [Discussion and conclusions](#) section.

## 2. Background

In the workplace, at home, or in the community, knowing how to treat health emergencies allows people to help anyone who may get injured or become suddenly ill while medical help arrives. How many people know how to react during health emergencies at their jobs? Even more important, how often do workplaces, schools, communities, or nearby hospitals offer this kind of training? It is also important to recognize the value of this kind of knowledge in any individual; someone with skills and competence in first aid and emergencies can be of help to his or her community, and he or she can save lives in any place and time.

Due to the importance of this topic for all people (not only for health personnel), Galileo University, aware of the need to train and reach as many people as possible in a small period of time, decided to develop a MOOC dedicated to introducing first aid and emergency treatment. For this purpose, a team of instructional designers, subject matter experts, graphic and video editors were formed.

Different from traditional classroom courses and online courses, MOOCs provide a sustainable model for the masses; they are open and completely online. MOOCs also represent a new opportunity for lifelong learners because they can form part of a learning community, allowing individuals who may lack the confidence to attend for-credit courses and those who cannot afford them to have the chance to continue studying. Additionally, they provide learning possibilities to students who don't have time to participate in a face-to-face course; because most of a MOOC's material is in video format, students can review the course content from any kind of handheld device (Mobile Learning) ([De Marcos et al., 2011](#)). Furthermore, MOOCs are designed under self-management systems, which enhance student interaction with content and automate learning activities.

With so many benefits to the usage of MOOCs, individuals who work in the medical field are considering the possibility of taking and incorporating MOOCs in the teaching and learning process of health topics. Lucey, Vice Dean of Education at the medical school of University of California San Francisco (UCSF), said “Online content delivery will be commonplace within about five years in medical school”. Some medical schools are shifting their teaching and learning methods, implementing “inverted classrooms” in which teachers assign video lectures to students, the students watch them at home, and during class, teachers and students discuss the content watched, promoting interaction, students' participation, and facilitating constructivist learning ([Harder, 2013](#)).

According to a review presented by [Liyaganawardena and Williams \(2014\)](#), the quantity of MOOCs on the subject of health is growing. During 2013, from 98 identified courses related to medical topics, they found that 94% of these courses were offered in English and that North American institutions created most of them. Courses had an average duration of 6 weeks and required 4.2 h of participant work per week. This review provides interesting insights; although the recurrent criticism related to the dramatic student drop-out rates from MOOCs, this methodology provides a huge potential as a means of virtual training for health personnel in the health education field.

[Sarkar and Bharadwaj \(2015\)](#), in the article “Adapting MOOCs for Medical Education,” pointed out the challenges that a MOOC of this type has to face. Usually, the lecture videos only present demonstrative content, but practical exercises are necessary to acquire the knowledge. Another challenge identified was the necessity of clear communication when students use massive forums; it is very difficult to have a conversation with the course teacher, so different strategies to handle and improve communication in massive forums is needed ([Morales et al., 2015](#)). Additionally, not all participants accepted the peer assessment. Usually, the students expected that a teacher would assess their work and not another student; as a result, an important challenge to overcome is process-focused assessment due to the number of participants. When a MOOC starts, it has a huge number of enrolled students who vary widely in educational backgrounds, age ranges, and expectations. In regards to the level of satisfaction achieved from this type of MOOC, [Aboshady et al. \(2015\)](#) study, “Perception and use of MOOCs among medical students in a developing country: Multicenter cross-sectional study” established that “Students who actively participated showed a positive attitude towards the experience, but better time management skills and faster internet connection speeds are required” ([Morales et al., 2018](#)).

## 3. Procedure description

Galileo University started in 2013 the design and development of five-week MOOC dedicated to introducing of first aid and emergencies treatment. This course was released under the name “Health Emergencies” and was deployed in Telescope project, which is the name of the MOOCs platform at Galileo University ([Hernández et al., 2013](#)). This course provides to its participants the basic skills and knowledge in order to recognize health emergencies for a range of common illnesses and injuries.

### 3.1. Technical aspects

The course was implemented using the .LRN platform, with the development of several adaptations to have a better visualization of contents and user experience. (a) The evaluation system was adapted to allow peer-assessment, presenting an assessment rubric to evaluate classmates for each learning activity. (b) The communication system of the forums for students integrated the OSQA<sup>1</sup> (Open Source Question

<sup>1</sup> <https://devada.com/answerhub/>

and Answer) tool that allowed creating a gamified scenarios, providing badges to highlight the main contributions, the most participatory students and thus motivate the massive interaction between participants and the learning environment.

### 3.2. MOOC structure

The course was designed in learning units, distributed typically one per week depending upon duration and objectives. Each unit had between 3 and 5 videos (learning content) with an average length of 6 to 9 min per video. These videos lectures were developed following a strict instructional design and were complemented by support materials such as embed powerpoint presentation, learning activities supported by cloud-based tools that show different real-life situations in which students have to make a decision or solve a case, discussion forums, which allow communication and interaction between learners to some degree and assessments (peer assessment or self-grading) associated with each topic.

This course began with an introductory unit, where the general aspects and the methodology of the MOOC were described to allow the students a better understanding of the learning environment, the overall course structure and evaluation methods. Each content unit had learning objectives, different strategies, collaborative and social learning and case studies. The main course objectives are presented in Table 1.

## 4. Methodology

This study employed a mixed method research (quantitative and descriptive) applying to an exploratory case-study. The quantitative approach was used to analyze information through statistical methods; students answered three self-administered questionnaires to identify the participant's satisfaction with the educational resources developed and implemented in the course.

### 4.1. Data collection

Data was collected from three self-administered questionnaires; the first (pre-survey) was composed of 21 questions designed to determine students' general demographic information (age, gender, country, professional status, highest diploma obtained, etc.). It also included questions related to their prior knowledge of MOOCs. This instrument was used to have a better understanding about the learners enrolled in the course and to know their learning preferences. To establish the level of MOOC adoption and to recognize the level of satisfaction students had with the course content, a post-questionnaire with 20 questions, combining closed questions, multiple options and weighted options using

Likert scale, was used to measure the levels. Additionally, a questionnaire related to dropout aspects was implemented, this dropout survey was focused on participants who did not finish the course. Each participant was provided with an information sheet related to the nature and purpose of the research and a consent form to be completed prior to being surveyed. All questionnaires were created using the LimeSurvey tool.

The data collection process is described in the next steps (1) participants enrolled in the course with their personal mail through the telescope website, (2) participants answered an online pre-survey about demographic information and general aspects, (3) all students had a bootcamp week to get used to the platform, (4) participants studied the four week lessons (videos lectures, support materials, learning activities, collaborative forums and quizzes), (5) participants who finished the course answered a post-survey to assess their MOOC experience. A special online survey was sent to participants who did not complete the course to find out the reasons for dropping out. All data processing was performed using the SPSS Statistics 20.0 program.

## 5. Results

### 5.1. Course demographics

The data collected from pre-survey represented 31% (660) of the total (2114) registered students. 58% of participants were female, 42% were male and the middle age was  $M = 31$  ( $\sigma = 11$ ) years old. Among participants, 18% had pre-university studies, 60% studied at university, 13% had professional occupations (Bachelor's degree) and 9% master's degree. The majority of students lived in Spain (48%), Guatemala (21%), Colombia (7%), México (5%), and Peru (4%); these countries represent 85% of all course participants. 77% of the registered participants indicated it was the first MOOC in which they had been enrolled. Most of the registered participants (57%) chose a MOOC because it seemed interesting and a good way to acquire new knowledge, and only 33% choose to participate in a MOOC based on the skills it develops in its participants which are relevant to their daily life and work.

### 5.2. Participation and behavior report

In order to analyze the participation behaviour of the students, a statistical analysis was used to examine the data captured by our platform (course access, delivery of tasks and participation in forums). The results obtained were classified according to the types of MOOC users defined by Hill (2013), 31% of the participants were in the "No-Shows" category, this category represents the students who enroll in a MOOC but never enter the course while it is active. On the other hand, 69% of the participants had at least one access registered in the MOOC,

**Table 1**  
MOOC topics and learning objectives.

Learning topic	Instructional objectives	Learning activities	Assessment type
<b>Strategies for taking care of ill patients</b> <i>Concept and characteristics. How to stabilize, resuscitate and monitor very sick patients.</i>	Identify the benefits of the ABCs: airway, breathing, and circulation	Activity 1.1: First aid for drowning in children questionnaire Activity 1.2: Creating guide to basic life support	Auto-grading and peer assessment
<b>Essential first aid</b> <i>Initial evaluation and management of the burn patient, types of fractures and epilepsy seizure types and symptoms.</i>	Show how to deal with a casualty of any age and with any potential risk situation	Activity 2.1: Burn patient management questionnaire Activity 2.2: Creating initial boarding mind map in: Burns, wounds, fractures and convulsions using a cloud based tools	Auto-grading and peer assessment
<b>General information about allergies and poisoning</b> <i>Anaphylaxis treatment &amp; management</i>	Study all general information about allergies and poisoning	Activity 3.1: First aid for food poisoning questionnaire Activity 3.2: Creating mind map about Stings and bites treatment, using a cloud based tools	Auto-grading and peer assessment
<b>How to prevent diseases and improve health promotion</b> <i>Healthy lifestyle habits</i>	To recognize the relevance those, have on health promotion and disease prevention.	Activity 4.1: Accident prevention questionnaire Activity 4.2: Creating mid map on preventing accidents, using a cloud based tool.	Auto-grading and peer assessment

**Table 2**  
Students participation.

Students participation	
Enrolled but didn't access the course	31%
Accessed the course at least once	69%
Did the first assigned activity	34%
Successfully finished the MOOC	2.37%

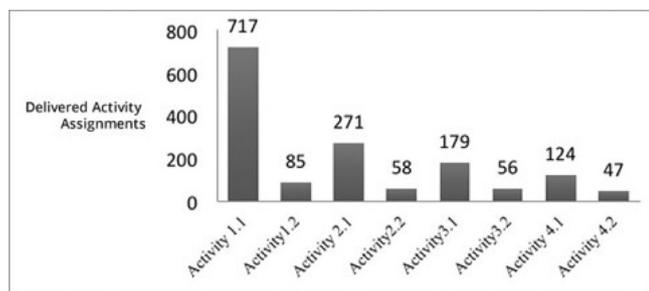


Fig. 1. Delivered activity assignments.

they were considered as “Observers”. The results obtained in relation to the students' participation during the development of the course are summarized in Table 2.

About the student's behavior, Fig. 1 shows the students' commitment to do the activities assigned per week.

From these results, it could be interpreted that the activities related to the use of web tools (activity 1.2, 2.2, 3.2 and 4.2 see full description in Table 1) were not well accepted compared to the activities of questionnaires; however, it is important to point out that students who did carry out these types of activities indicated that they felt motivated to learn through interactive animations and dynamic activities such as mind maps.

Related to participation in forums, Fig. 2 shows the number of posts created in each forum. Although the first forum showed a high participation of 30% of the students who accessed the course at least one time, subsequent units were stationed at 16%, 12% and 15% of participation.

The students' participation primarily consisted of questions and doubts about how to deliver activities and the reporting of problems with accessing the tools for creating activities.

### 5.3. Completion analysis

The results showed that 2.37% of participants completed the course, 58% of them were female and 42% male. The average of the final grades were 75.4 ( $M = 75.4$ ,  $\sigma = 12.18$ ). The post-course-survey

assessed the individual efficiency and the general experience that the participants got from the MOOC, the survey includes questions regarding the course content, support materials, forums, peer assessment, and the assistance got from the MOOC experts solving their doubts on forums.

One relevant part of the study was to assess if participants achieved the expectations they have before starting the course, 69% of students pointed out that the course met most of their expectations. 6% of students answered that they spent approximately 7 h weekly doing graded assignments, tests and participating in forums, and 56% of the students did course activities at home. Regarding forum participation, 34% of students asked questions in the forums and helped solving doubts to their course mates. Nevertheless, 10% of participants indicated that they didn't enter the forums at any time; additionally 22% entered to the forums just to read other classmates' participation. In relation to peer assessment performance, 73% of the participants who finished the MOOC expressed that this kind of evaluation improved their learning performance.

### 5.4. Drop-out analysis

To analyze students' drop out, it was sent a dropout-survey to participants who did not complete the course. This instrument collected general information about participants and the major reasons why they did not finish the course; most of them dropped out the course for personal or academic causes like quality of the course content, they were not used to learn from video lectures, work overload and working time arrangement. The main factors for dropout indicated by students were: (a) personal and working time arrangement, (b) overload of activities in their work, and (c) don't have enough time to study at home. The average age of participants who dropped out the course was  $M = 37$  years old; 61% were male and 56% had a Bachelor's degree (data collected from the dropout-survey).

Students who did not complete the course (47%) expressed that the main reason they dropped out the MOOC was because their “job responsibilities were modified during the course duration”. In regard to the academic situations that didn't let them to finish the course, 40% said “it was too difficult to have a full-time work, and at the same time, to study a MOOC”. 15% selected the option “other” giving reasons like “don't having enough time to do the activities assigned”, “weak internet signal”, and “confusion in forums due to many messages”. 9% expressed “not being able to have a good performance in the MOOC”; 2% said, “didn't have basic technical knowledge for the course”, 2% mentioned, “content and activities were very demanding”, in the other hand 3% highlighted that “content and activities were not interesting”. 6% said that “the MOOC was unwell made”, and 2% mentioned that the “Course was unwell taught”. Table 3 shows the complete results of the dropout analysis.

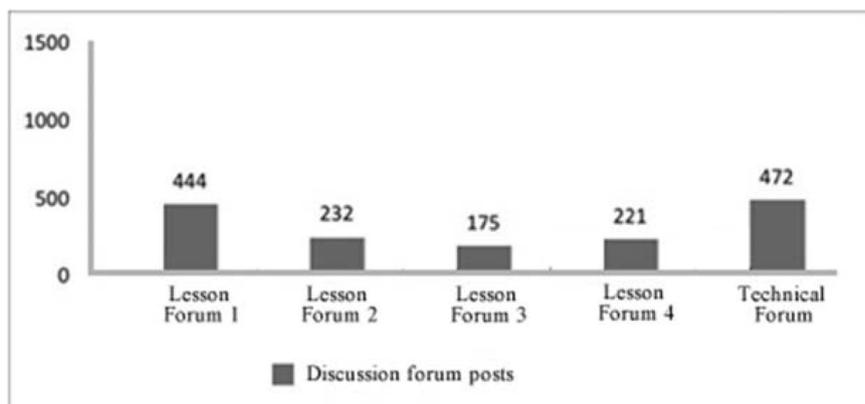
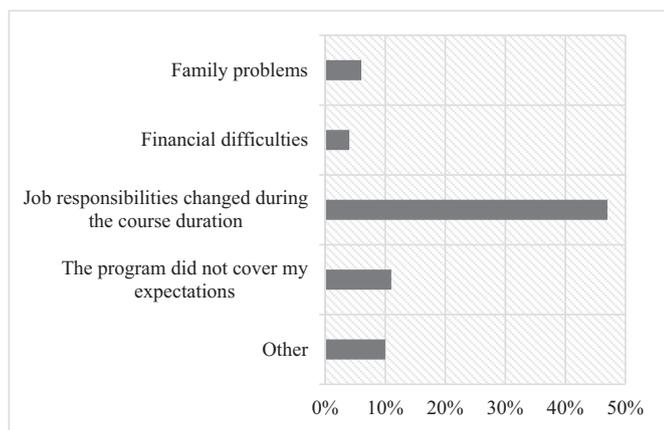


Fig. 2. Forums participant behavior.

**Table 3**  
Drop-out analysis.

Personal reasons	Family problems	6%
	Financial difficulties	4%
	Job responsibilities changed during the course duration	47%
	The program did not cover my expectations	11%
	Other	10%
Academic reasons	Course were poorly taught	2%
	Course had been poorly created	6%
	Academic program too difficult/demanding	2%
	Academic program was not challenging	3%
	Didn't have basic technical knowledge for the course	2%
	Too hard to work full-time and study the course	40%
	Not able to perform well in the course	9%
	Other	15%



**Fig. 3.** Personal reasons for dropping out the MOOC.

Figs. 3 and 4 present the personal and academic reasons for dropping out the MOOC.

It is important to mention that most of the participants were not able to organize their time in an adequate way, making hard the completion of learning activities and having an active participation during the MOOC; possibly, the root of this problem is the same recurrent reason found in any virtual course: the lack of commitment of the students.

## 6. Discussion and conclusions

This study presents the results obtained from the experience of designing and developing a MOOC on Health Emergencies. The overall aim of this case study was to know the student perceptions, motivation,

behavior, and the completion and dropout rates, as well as, the impact of a MOOC in reaching and forming a larger population.

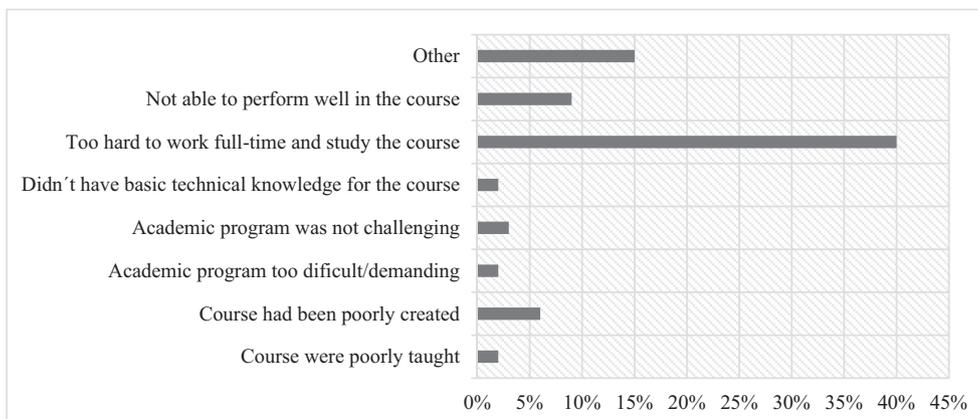
According to the results, students considered that using video lectures, as a learning resource, was very useful to learn about this topic. The different learning activities such as case studies, and activities with cloud based tools, made possible to practice the learned concepts in an interactive way, the cloud based tools increased student's engagement with the course. The student's motivation findings were connected to the content and its ability to meet the student's needs. Some of the participants' comments were: "The videos were very useful and complemented the subject", "the learning resources were very demonstrative", "the case studies allowed me to apply the acquired knowledge and solve real-life problems".

Overall, the students had a good learning experience. They reported, they had acquired knowledge from the course and it would help them in their profession. More than 88% indicated that they will recommend this course to their friends and 90% reported having learned a lot with the resources provided (e.g., videos lectures, learning activities, etc.). They expressed that they would like to continue learning with this methodology, 95% of the students said they would repeat this experience. In relation to the first research question examined (RQ1), we can confirm that the course has been useful for the students and provided a good learning experience.

However, the results also revealed some important issues to be considered in the design and development of a MOOC of this characteristic. The first aspect to be considered is (1) the use of massive forums; forums do not allow for adequate follow-up of the students' participation, making it difficult to promote a collaborative and engaging learning experience. We suggest using alternative media, such as social networks and Facebook groups, among others, to facilitate communication between participants.

Another aspect to be considered is the (2) assessment method. MOOCs rely on the individual learner's self-proclaimed affirmation of the honor code because evaluations are not supervised and the possibility of using unfair means to complete an exam cannot be eliminated. In addition, this study showed that a large percentage of students prefer to receive feedback from the teacher rather than from a peer, yet 83% of participants indicated that a peer-assessment methodology improved their learning experience. On the other hand, the self-assessment test's multiple choice questions do not guarantee the development of the skills and abilities necessary for this learning topic.

In the MOOCs context, high drop-out rates are a much-criticized issue. However, it is important to note that not everyone who registers for a MOOC wants to complete it and earn a certificate. According to Hill (2013), there are different types of students in a MOOC (i.e., no-shows, observers, drop-ins, passive participants, and active participants); only a low percentage of students are active and log into the platform. Therefore, another relevant aspect to consider is how to



**Fig. 4.** Academic reasons for dropping out the MOOC.

calculate the drop-out rate, based on the number of registrants or participants who viewed the course at least once.

In view of the results, we can conclude that the drop-out rate for this course is very high (97.63%). The main personal and academic reasons for dropping out of the MOOC are: (a) 40% of the participants indicated that “it was too hard to work full-time and study the course” and (b) 47% of the participants indicated that their “job responsibilities changed during the course duration, making it difficult to finish it.” These main desertion reasons provide support for our research question (RQ2).

Another of the main conclusions of this study is that students' participation can be affected by some design features, such as the quality of the video production, the type of support material, and the learning activities that were used. However, students who lack basic competencies (e.g., self-regulation, self-efficacy, and communication skills) will probably drop out from the course, even if they participate in a well-designed MOOC.

Real-time detection of dissatisfied students, as well as the design of better courses, could increase retention rates and students' motivation to learn in this methodology.

### 6.1. Study limitations

The building of this MOOC presented several challenges and limitations for the development team. The content had to be designed to align with participants with little or no previous exposure to this academic discipline, and also with the participants who would have experience in first aids, such as professionals, postgraduate students or college students.

The team had to make a decision between providing enough basic information for novices but still providing enough information to engage experienced learners. Incorporating multimedia, learning activities with real scenarios, video lectures with a good level of description, and guidelines to the students became the key aspects of the MOOC design. This is the reason why the course was designed to be a ‘jumping-off point’, intended to provide basic instruction in the first aids, but also to nourish and facilitate more challenging discussions by participants, not bound by their individual skills or previous knowledge. It was important to provide good communication support, forums, email messages, and study communities were implemented. A group of tutors was also trained to guide and solve the student's doubts.

Another important aspect was the video production, as it was mentioned before video lectures are a key component in a MOOC, and they had to transmit abstract concepts, using clear explanations with a simple language, pictures, animations, and simulations. At the beginning of the project, it wasn't clear to what extent this would be and how

much time and budget would be required. The videos were produced with high-quality equipment, a team of actors and many editing hours.

In spite of these limitations and another aspects such as forums, assessments method, and drop out rates, to be considered in the design of MOOCs related to this discipline, the results obtained demonstrate the viability and the benefits they may have.

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