How to design

Massive Open Online Courses

to facilitate student participation

Dissertation

zur Erlangung der Würde einer Doktorin der Philosophie

vorgelegt dem

Institut für Bildungswissenschaften

der Universität Basel

von

Ortega Martín, Ana

aus

Spanien

Basel, 2022

Buchbinderei Bommer GmbH

Genehmigt vom Institut für Bildungswissenschaften der Universität Basel, auf Antrag von Prof. em. Dr. phil. I habil. Hans-Ulrich Grunder und Prof. Dr. Patrick Bühler.

Basel, den 16. November 2021

Die Direktorin Prof. Dr. Elena Makarova

How to design Massive Open Online Courses to facilitate student participation

A dissertation presented

by

Ana Ortega Martín

to

Institut für Bildungswissenschaften

Universität Basel

for the degree of

Doctor of Philosophy

Doctoral Committee:

Prof. em. Dr. phil. I habil. Hans-Ulrich Grunder

Prof. Dr. Patrick Bühler

Universität Basel

Basel, Switzerland

May 2021

Dedication

To my children Inés and Guillem, my husband Javier, and my parents, Agustin and Rosa who were always close to me, supporting me, cheering me up, encouraging me to finish this challenging project.

Acknowledgments

I would like to thank Prof. Dr. Hans-Ulrich Grunder for allowing me the opportunity to make this project a reality. In addition, I would like to thank Ms. Begoña Gros for providing the means and the encouragement to develop this research. Finally, I am very grateful to Prof. Grunder, Prof. Gros and Prof. Bühler for their guidance and support during the development of the research, and for their best professional advice, knowledge and expertise in the field.

Ana Ortega Martín

May 2021

Dissertation Advisors:

Prof. Dr. Hans-Ulrich Grunder

Prof. Dr. Begoña Gros Salvat

Prof. Dr. Patrick Bühler

Ana Ortega Martín

Abstract

This research invites one to reflect on where higher education stands, and where it may go next. The socio-economic world is currently evolving extremely quickly. Online media is mainly responsible for this development. Companies demand partners who are constantly innovating and developing to remain competitive in the market. In other words, conducting research and innovation. Online life has made people curious; professionals and people in general are interested in knowing more about these innovations and developments. This is exactly the valuable view with which we should approach online education. Online education is joining forces with the traditional education system to strengthen the connection between universities and the job market. However, the year 2020 has represented a turning point for all sectors, including the education sector. The need for social distance has led universities to react quickly when meeting students' requirements. From this standpoint, online education has played a meaningful role, particularly MOOCs. This research was developed in a bid to enhance online learning environments that have a direct impact on student participation.

I am aware that on the one hand, online learning may still benefit only those who have the opportunity and have the necessary means, such as a laptop or Internet access. On the other hand, online education is increasingly engaging a significant number of learners and those

who are returning to education. A new trend that emerged in 2012 and is currently testament to the investments made in online learning, confirmed by the current figures of registered students, is the MOOC.

Against this background, this study is focused on enhancing online learning environments with the aim of improving participation rates. A comprehensive study of characteristics of MOOCs that make them especially interesting and appealing, as well as of the instructional design, focused on the MOOC design phase, was undertaken. A disaggregation of meaningful factors comprising a MOOC curriculum is carried out with the aim at assessing whether these factors have an effect on student participation. Furthermore, this doctoral thesis invites reflection on identifying the extent to which student engagement in MOOC curriculum design improves student participation rates. With regard to the research methodology, I opted for a mixed quantitative and qualitative methodology through document and statistical analysis. An exhaustive description of the data collection instruments is provided. Several of these were designed specifically for the study, such as the $CAT_{50\%}$ index (the completion of more than 50% of assigned tasks). This was developed to help academic staff to identify the level of student engagement in a specific MOOC. In addition, an explanation of sources, sample and data collection processes is provided. The source, an experienced and a pioneer in the MOOC initiative in Europe, located in Switzerland, provided me with a sample of 79 MOOCs in the fields of sciences and technology. The results provide instructors and institutions with a methodological outline to facilitate the MOOC design process. This framework covers all the factors contained in a MOOC that have a positive effect on student participation.

As a staunch defender of online education, I would like my dissertation to be used as a tool to enhance this training area. The research seeks to improve the learning experience of students in MOOCs in higher education.

Table of contents

List of figures

List of tables

List of abbreviations

ASP	Active student participation
$CAT_{50\%}$	Index that measures the completion of more than 50% of assigned tasks
CDT	Course design teams
CGHE	Centre for Global Higher Education
FE	Further Education
ICT	Information and communication technology
ID	Instructional Design
MOOC	Massive Open Online Course
PLE	Personal Learning Environment
PLN	Personal Learning Network
QRF	Quality Reference Framework
SaLT	Students as Learners and Teachers
SEO	Search Engine Optimization
UX	User Experience
VLE	Virtual Learning Environment
VET	Vocational Education and Training

Introduction and justification for the research

1.1 Research problem

A Massive Open Online Course or MOOC is a type of virtual learning environment (VLE). A MOOC is a learning resource, massive and open. Many institutions are offering these online courses to students all over the world, in the millions, for no charge. Anybody who has an Internet connection and wants to learn can access these great courses from excellent universities, and receive a certificate at the end of it (Agarwal, 2013).

Since MOOCs were first introduced in 2008, emerging in 2012[1] as an innovative and powerful tool, they have experienced a steady growth. Increasingly, students choose this kind of online training as a way of deepening their knowledge in a particular area, or exploring new ones.

The current situation has guided society to adapt life and business models. Here, MOOCs have a meaningful role because they are a key choice that keeps millions of people connected through training.

Over the few last years, online training has become increasingly popular among students. In particular, since early 2020, we have been living in an unusual situation where people are required to be at home, and distance education has grown exponentially. This has guided

[1] Massive open online course: Retrieved from <https://en.wikipedia.org/wiki/Massive_open_online_course>. Last accessed July 2, 2020.

institutions to change their strategies and to focus all their efforts on improving this type of training.

As online training is still at an early stage, where MOOCs emerge as a meaningful tool which meets students' needs, one can find little empirical research, particularly when this research began to be developed. Thus, this research aims to contribute to the field of the design of MOOCs. This is intended to deepen and enhance the issue of student engagement in this type of training.

Numbers show that there is still a high number of enrolled students in MOOCs who drop out of the course. For this reason, and because there is a market niche that MOOCs are assumed to fill, institutions have begun to develop tools/guides which facilitate instructors and designers in creating MOOCs that meet students' needs. Studies such as the following (to mention only a few) are constantly emerging in response to the current need. These include "Engaging with Massive Online Courses" (Anderson, Huttenlocher, Kleinberg & Leskovec, 2014), "Guidelines for Quality Assurance and Accreditation of MOOCs" (Commonwealth of Learning, 2016), "Instructor experiences designing MOOCs in Higher Education: Pedagogical, resource, and logistical considerations and challenges" (Zhu, Bonk & Sari, 2018). All these are focused on delivering a MOOC that will ensure effective learning. Instead, the present research tracks the progress of students during the course, as there is a lack of studies taking this perspective.

This led me to pose the following two broad research strands:

(1) How important is the MOOC design phase in the instructional design. An instructional design model provides academic staff with the required guidelines and tools to organise a MOOC comprehensively. This enables academic staff to deliver a high-quality MOOC as they will consider all the meaningful factors that should be taken into account to ensure high student participation. Thus, a disaggregation of processes, procedures and factors included in the MOOC design phase was undertaken in this study. The aim was to identify the most suitable factors to encourage student engagement.

(2) In the review of the literature developed further on, one can find studies which state that co-design undertaken by academic staff and students during the design phase has advantages for achieving a higher student participation rate during the MOOC. MOOCs are an innovative service to students, and are still at an early stage of development. As the younger generation is most connected to new technologies and to networked learning, students are the most suitable target audience to identify what a MOOC should include in its curriculum. The goal is that a MOOC should meet students' needs; if it does, rates of student engagement might be higher.

In addition, the study aimed to establish how emerging pedagogies and emerging technologies influence the design of learning environments. It is about a pedagogy based on the construction of knowledge, collaboration, resource-sharing between people, the construction of a student community and the use of information flows in networks. All of it designed to encourage networked learning.

Participatory design based on co-operation between teachers, design experts, researchers and, as a novelty, the student participation, was developed as the second research strand.

To bring the introduction to a close, this research was intended to provide an overview of the processes and procedures included in the MOOC design phase with the aim of identifying the most suitable features it should include. As a result, a methodological outline was developed to create a useful tool for academic staff. This included the best training elements (also called factors) that a MOOC, developed in the most appropriate learning environment, should comprise to encourage student engagement.

1.2 Focus of the study

MOOCs are a form of teaching/learning where collaboration and students' participation is essential. MOOCs offer learners free access to quality educational contents. There is no acceptance procedure, so registering for a MOOC is very simple. A significant number of learners are benefiting by accessing world-class education and an engaged world community. MOOCs are faithful exponents of connectivism and networked learning, which are benchmarks in the introduction of new technologies in education.

There is a diverse target audience for MOOCS; international learners, undergraduates, graduates and postgraduates, who might be late or lifelong adult learners, or professionals who are taking these courses for career-related outcomes.

Figure 1. MOOCs find their audience: professional learners and universities (Shah, 2017).

Of this target audience, the newest member and one who has come back to training is not the traditional university student but “the lifelong career learner”. This target group might be well beyond their college years and they take these online courses with the objective of achieving professional and career growth. Their goal is continually to adapt to the changing job market. In most cases, lifelong career learners are between the ages of 25 and 45. Thus, they are also a meaningful group to consider.

The reasons for which people decide to enrol in a MOOC are many. Many people do not have an interest in attaining certificates for the courses for which they register. The most important thing is content that interests them, in other words, knowledge, interaction with a world community and free education from the world’s best universities.

This research is focused on an analysis of MOOCs, particularly their design phase, i.e. analysing them from the viewpoint of how to maintain a high student participation rate. Aspects such as what a MOOC offers, what kind of student profile they attract or the reasons for students’ enrolment in a MOOC, are nuances that were considered.

This research approached the study of a sample of MOOCs from one recognised institution in the field of study. Owing to privacy rights, I can only say that this university is located in Switzerland, and moreover, is one of the pioneers in the MOOC initiative in Europe. I want to thank this institution for its collaboration, which has allowed me to develop and to complete the study. This institution provided me with a sample of 79 MOOCs. From these, I analysed 54 MOOCs; the remainder did not provide the information required. I collected data related to student engagement in MOOCs from these 54 courses.

This university works on two platforms (edX and Coursera). Both are leaders in the MOOC sector in a bid to bring students around the world the best of higher education. They offer free or affordable online courses, specialisations and degrees in a broad variety of subjects such as Law, Engineering, Science, Business, Computer Science, Public Health, Social Sciences, Computer Science, and so on. The sample of MOOCs for my research was focused on MOOCs in hard sciences. Subjects such as Engineering, Maths, Physics and Biology were included in the MOOCs which I investigated.

1.3 Research aim

The main aim of this research was to study how students who are enrolled in a MOOC can be provided with a proper learning environment that is adapted to their needs, and which includes useful training elements, information and personalised guidance. The final goal was to encourage student participation in MOOCs.

This was to be done by designing a methodological outline which would provide designers and facilitators with a useful tool that would allow them to design MOOCs with the most appropriate learning environments in order to foster student participation.

1.4 Research questions

Research questions were posed from the perspective of an emergent process. The emergence of new questions influenced the developing process of the project, and research questions were adjusted as a result of the constant changes in the area of online education, new needs, and limitations during the study process.

- What characteristics/features should a MOOC have in order to ensure a high level of student participation?
- What are the most suitable factors to consider when designing a MOOC with the aim of encouraging participation?
- Would it be beneficial for the course if students participated in the design of MOOC?

In the first question, I am referring to a more general approach; the identification of processes and procedures in the design phase that are essential to launch a MOOC that will encourage student participation.

In each phase of launching a MOOC (analysis, design, implementation and evaluation), many items, also called factors, can be identified. Specifically, in the design phase, and related to the second question, I am referring to the factors that would be most likely to foster student participation.

Focusing on the third question, the aim was to identify whether there are MOOCs in which students have participated in the design, engaging for example in the development of the curriculum of the MOOC.

In conclusion, these three questions were addressed to study the MOOC design process and to identify the most suitable factors for meeting students' needs, and thus fostering student engagement.

1.5 Specific objectives

The objectives of the research were as follows:

- To analyse MOOCs in order to define design outlines.
- To identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation.
- To collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation.
- To identify the factors that best encourage student engagement.
- To analyse the role of student participation in the design of a MOOC curriculum.

Within the framework of the design of MOOCS, the main objective of the study was to identify those aspects to be improved upon in order to structure a (design) outline. The intention was to provide students with a MOOC that would adapt to their needs. This had to include useful training elements and information, and personalised guidance. Finally, I proposed a methodological outline.

1.6 Methodology

This research project attempted to answer the need to progress in the study of new MOOCs, with student participation in innovation activities and educational research at its core. This was intended to provide professional guidance linked to a commitment to improving institutions, the role of teaching staff and the learning processes in online education.

From this position and given the diversity of areas of knowledge in education, the methodology and data collection were adapted to the learning objectives. Specific methods, techniques and specific resources were used as pedagogical design to consider specific didactics.

The research methodology is developed in section II. Methodological framework. The scientific research methodology chosen for the project was a mix of qualitative and quantitative methods. The project was developed according to a descriptive research method and document analysis in the search for publications targeted at MOOCs design. The aim was to analyse how MOOC design is planned.

Reflecting on the different research questions, data collection and chosen methods, the fact that I used both quantitative and qualitative methods would, I hoped, allow me to achieve the best interpretation of the data. My research design for monitoring and assessing the results was descriptive, exploratory and observational in nature.

1.7 Organisation of the thesis

This thesis is organised into four broad parts. The theoretical framework, the research methodology, the results and the conclusive framework. Each part is organised into different chapters.

Section I. The theoretical framework. This block consists of four chapters in which the more meaningful concepts framed under the goal of the project are developed. Concepts such as the current state of online training, what MOOCs are intended for in this type of education, an approach to the MOOC design process where co-creation and active student participation are developed, and an introduction to the instructional design process in which the various dimensions involved in the design process are broken down for the first time (pedagogical, technical, strategic and organisational). The first chapter highlights new trends in online education resulting from the new digital era and new learning styles. These include the new roles of teachers, students and tasks, and an introduction to networked learning, from which the concept of connectivism through online collaborative learning has emerged. The second chapter provides an overview of MOOCs: types of MOOCs, what statistics say about their impact on education, and the challenges currently facing MOOCs. Chapter three focuses on meaningful concepts involved in the design process of MOOCs: co-creation and active student participation, which guided the research. On the topic of co-creation, there is a discussion of how cooperative creativity is increasingly being introduced in higher education, the roles of all parties involved throughout the co-design process, and the three ways of including student participation in pedagogical planning. Active student participation and the extent to which students should engage actively in the design process phase were other considerations that helped to frame this research. Furthermore, effective interactive teaching and how students learn in an online setting led me to reflect on how this research was approached. Finally, this section includes a fourth chapter which provides an overview of the instructional design process. This indicates the importance of this systematic tool in ensuring high rates of student engagement. A breakdown of pedagogical, technical, strategic and organisational factors of a MOOC is provided, and a discussion of what engages MOOC students in learning and what makes a high-quality MOOC.

Section II. The methodological framework. In the single chapter in this section, the design of the research, the kind of study conducted, the main goals of the study, and why I chose a mix of quantitative and qualitative methodology such as document and descriptive statistical analysis is discussed. Furthermore, a description of data collection process, instruments, sources, and sample is provided.

Section III. Results. This part of the thesis presents the findings of the analysis of data collected from a documentary search and a statistical analysis. This is included in a single chapter on the analysis of factors and comprises two main sections: the co-designing of MOOCs and active student participation during the course.

Section IV. Conclusive framework. Key aspects are drawn from the literature and from the results in the discussion and conclusion chapter. Finally, several proposals for future interventions and potential future research lines are suggested. In the second chapter, a methodological outline is proposed for instructors and institutions. This assembles all the meaningful factors of a MOOC that have a positive effect on student participation.

Back matter. This includes the bibliography, references, appendices and supplementary materials, such as graphs and tables.

Summary

In this first section, a general approach to the research study was provided. Both an introduction and a justification were developed to provide a focus for the study, that is MOOCS. Lifelong learning has become a tool with which people are increasingly expanding and enhancing their knowledge, for work or simply for pleasure. In this training area, MOOCs are likely to play a very important role in lifelong learning. Features such as ‘anytime’ and ‘anywhere’ guide MOOCs to the focal point of a specific target group: international learners, undergraduates, graduates and postgraduate professional learners.

Despite the high rate of student registration, completion rates are still lower than desirable or expected. Therefore, a study of MOOCs was required, the aim of which was to ensure a high level of student participation. Several aspects were developed in the study: (1) promoting co-design and students’ participation, (2) identifying the characteristics of a successful MOOC, (3) defining the variables that ought to be considered when designing a MOOC, and (4) identifying the technology that facilitates student participation.

The design of a methodological outline for creating MOOCs that meet students' needs was the final goal of the project. The scientific research methodology chosen for the project in order to achieve this goal was a mix of qualitative and quantitative analysis. Data were collected from institutions, the observation of MOOCs, and the search for publications.

Once the analysis, discussion and conclusions were completed, the design and the development of a proposal of this methodological outline was performed. The design was adapted to the context and the dynamics. The aim was to generate guidelines for the implementation of educational designs in similar contexts. Three aspects were considered: (1) knowledge: students' academic discipline. Analysis of students learning needs, specific material and definition of training objectives, (2) methodology: analysis of teaching activities, learning planning, didactics materials, contents, appropriate learning resources, and assessment, and (3) technology: using the methodological framework to analyse what technology is required to develop the learning environment in line with learning objectives.

Thus, the design outline was developed with some of following aspects in mind: "(1) learning tasks, (2) supportive information, (3) procedural information, and (4) part-task practice" (van Merriënboer & Kester, 2014: 1). This should comprise, among others, elements: (a) the use of different transferable competences, such as problem solving and communication, (b) the strengthening of the relationship between the instructor and students, and between the learning process and students.

SECTION I. THEORETICAL FRAMEWORK

Chapter 1. Online training

1.1 New learning styles in the higher education area

The rapid development in ICT (information and communication technology) and the proliferation of social media have significantly enhanced communication in general. Currently, there are no limits when it comes to distance or time zone for our communication. Particularly, in the higher education area, ICT is changing the learning styles of many students. The interface standard "world on your desktop" is now complemented by: (1) portable devices that remove spatial and time restrictions, providing the opportunity to learn anywhere and anytime, and (2) multi-user virtual environments where people interact with each other. Institutions of higher education are thriving with these new technologies as an addition to the traditional style in order to provide teaching adapted to styles that are gaining popularity (Ketelhut & Niemi, 2007: 165). These learning styles include features such as: (1) fluency, (2) community learning, which implies that knowledge and experience are distributed through a community and a context, thus cooperation and collaboration are means of communication, (3) the balance between experiential learning, guided tutoring and collective reflection, and finally, (4) the co-design of personalised learning experiences according to the needs and preferences of users (Dede, 2004: 1). Furthermore, ICT has contributed to the quality of teaching, learning and research, both in traditional and virtual education institutions.

For all these reasons, institutions have had to reorient their strategies, adapting them to this new reality of learning styles that must support their main functions as higher education institutions, educational establishments, and generators of knowledge and technology (University Leadership and Management, 2012).

1.2 Lifelong learning and virtual training

Lifelong learning has gained relevance in recent years. This type of training, which takes place outside formal education, has led to students looking for MOOCs (Steffens, 2015). These massive online courses respond to the specific needs of professional learners who are studying for career-related outcomes, in other words, to improve their professional careers (Shah, 2017). Rick Levin (2017), the Chief Executive Officer (CEO) of Coursera, concluded at a European MOOC[2] Stakeholders Summit (EMOOCS) conference that “MOOCs may not have disrupted the education market, but they are disrupting the labour market” (Levin, 2017, as quoted in Shah, 2018a).

Technological change requires more active and stronger links between education and the labour market. In general, in developed countries the connection between learning and earning is a reality (The Economist, 2017). As a rule, investing in formal education results in obtaining the corresponding compensations for the rest of your professional career. Because of the financial crisis (2008), there is a debate calling this close connection into a question. What is clear is that, nowadays, the job market is diversifying, and those with a more diverse and complete education will normally move onto the route that leads to higher-paying jobs (OECD, 2012: 3).

[2] European MOOCs Stakeholders Summit. <http://emoocs.eu>. Last accessed May 3, 2018.

Keeping this in mind, one could say that training acquired by a person throughout his lifetime is much more dynamic today than years ago. Knowledge acquired today has an expiration date (Lucky, 2019). For this reason, lifelong learning is establishing itself as a way of connecting the individual with this better future. This update of knowledge is essential for a successful professional career (SkillsyouNeed, n.d.). In line with this approach, an increasingly large number of people have an urgent need for training (at their fingertips or at their disposal). Virtual training allows billions of people to have access to lifelong learning, breaking down barriers and connecting people: everyone, anywhere and anytime (Lidoria, n.d., Director ITM University Online for Elets News Network (ENN), as quoted in Akash, 2018).

When considering the cost of studying, it is important to take account of the advantages and disadvantages of different types of training, according to Monson (2017.). On the one hand, there is the traditional 'lifelong learning', which has a significant cost. First, the actual mobility costs of learners attending classes: transportation costs, and the time it takes learners to arrive and remain for the duration of class. In addition, the high cost of fees to enrol in a course in comparison to registration for a MOOC. On the other hand, there is online training, which has very attractive advantages such as: (1) it is a very flexible way of training. Besides allowing learning at home and on the road, you can create your own schedule, (2) online training access is very easy, and it allows one to start a course with only a few clicks, (3) transportation costs and the time learners invest going to classes are eliminated, (4) better retention of knowledge: an interesting and interactive online training course can increase learner knowledge retention more than listening to a lecture or reading material (Ibrahim & Al-Shara, 2007: 351). However, in addition, there are unfortunately disadvantages to online training, including the following: (Tamm, 2019): (1) It requires self-motivation. It is isolated. It is flexible and you need to organise your own schedule. But, on the other hand, you can set your own work pace,[3] (2) the student does not have direct access to the tutor/instructor/coach. Sometimes there is no immediate feedback, (3) online training requires learners to have continuous access to technology. Currently, there is only a small percentage of the population who can afford this.

In this research I intended to seek solutions to overcome some of these disadvantages. The fact of being isolated at home with no direct access to instructors, suggests that the environment and the features of the MOOC are key and should best meet students' needs.

1.3 Roles of teachers, students and tasks in online education

In online teaching, instructor would be the term that is the best definition of a teacher of online courses (Taylor-Massey, 2015). Mentoring and facilitating would be his primary roles (Davis, 2014). One of the new roles that the coach/instructor must adopt as facilitator in online learning environments is to be a constant presence, through personal introductions, chat rooms, timely responses to inquiries, and swift feedback on assignments (Taylor-Massey, 2015). He must play the role of "social manager", providing a sense of community and ways of interaction among all participants. This role, which requires more creativity and more effort than in a traditional classroom, is carried out through emails, discussion forums, chat rooms, videos, etc. (Taylor-Massey, 2015).

[3] I will return to the concept of self-directed learning in chapter 3: how students learn in an online setting? There is a brief review of self-directed learning (SDL) and self-regulated learning (SRL) in section I: Theoretical Framework.

In addition, the teacher should be dynamic and adaptable to new situations during the online course, adopting and embracing new ways of doing things. In the role of mentor, an online coach/instructor must also play "content coach". Although the onus to learn is more on the students, the coach must guide them during the learning process, providing tips or snippets about content, identifying and focusing on relevant issues to consider, or providing critical questions to reflect upon (Taylor-Massey, 2015).

Furthermore, students share part of the role of coach or instructor by providing support for one another. Increasingly, there is talk of a student-centred approach, in other words, we talk about placing the student at the centre of the learning process (TEAL Center Staff, 2010: 1). In other words, students take an active, participatory (Brown et al., 2012: 53) and critical role in connectivism learning (Brown et al., 2012: 13) through exchange (Brown et al., 2012: 108), communication, collaboration and cooperation (Brown et al., 2012: 61). The aim is to think about what students do to learn, more than what the teacher/tutor has to do to teach (Acat & Dönmez, 2009: 1805).

The teaching methodology promoted by the framework of the European Higher Education Area (EHEA) places more importance on the student, who is the central focus of the learning model. This is a model in which students work in a more independent way without depending on master classes, or on knowledge acquired within the classroom's physical space. This also requires self-regulated learning[4] on the part of the student.

[4] Self-Regulated Learning (SRL) is derived from educational and cognitive psychology and used in the school environment. In Self-Regulated Learning the instructor or learner may define the learning tasks. Retrieved from: <http://www.ehea.info/index.php>. Last accessed August 20, 2020.

With reference to tasks, students will be provided with tasks/activities, according to connectivist principles. In other words, those activities have the objective of improving: (1) the autonomy and (2) the creation of PLNs (Personal Learning Network) (Connectivism from Wikipedia):[5]

> A personal learning network is an informal learning network that consists of the people a learner interacts with and derives knowledge from in a personal learning environment. In a PLN, a person makes a connection with another person with the specific intent that some type of learning will occur because of that connection.
>
> Personal learning networks share a close association with the concept of personal learning environments [PLE]. Martindale and Dowdy describe a PLE[6] as a "manifestation of a learner's informal learning processes via the Web. (Personal Learning Network from Wikipedia)[7]

In order to attain these two goals, it is important that students feel comfortable and confident using new technologies to build their own efficiency.

The kind of networked supporting structure that involves students in critical learning should therefore be based on the creation of a place or community where participants feel

[5] Connectivism from Wikipedia. Retrieved from: <https://en.wikipedia.org/wiki/Connectivism>. Last accessed October 31, 2020.
[6] Personal Learning Environment. Retrieved from https://en.wikipedia.org/wiki/Personalized_learning. Last accessed April 4, 2021.
[7] Personal Learning Network. Retrieved from < https://en.wikipedia.org/wiki/Personal_learning_network>. Last accessed April 4, 2021.

confident, comfortable and valued. In addition, they should access and interact with resources and with other students (Kop et al., 2011, as quoted in Ally et al., 2019: 52). Otherwise, their level of participation and engagement could be negatively affected. Thus, regarding learning spaces (I am referring particularly to online environments), it is essential that they are improved with the collaboration of students. After all, students are the final users. If this approach is followed, e-learning might become a powerful learning tool, attractive and accessible to everyone.

From this starting point, the search to find the best environment for MOOCs that would facilitate student engagement was begun. A comprehensive study of the instructional design method, which defines how to plan and organise the entire design process of a MOOC was conducted. This theme is tackled further on.

1.4 Introduction to networked learning

Networked learning is a process of creating, establishing and keeping network connections and communication among people and information. This medium is used to obtain the necessary resources to provide support during the learning process. Connection is the main concept of networked learning. In this approach, the learning process is related to the idea of maintaining relations with other students and with learning resources (Dirckinck-Holmfeld, Jones, & Lindström, 2009: 2-3).

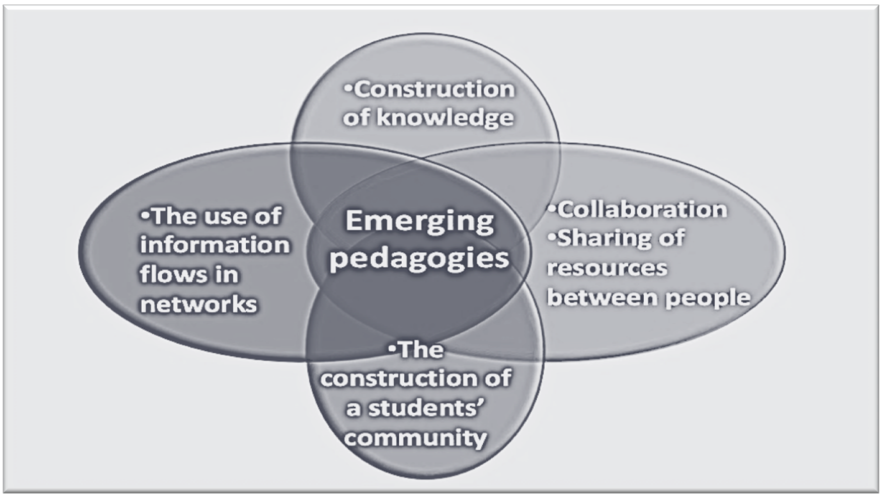


Figure 2. What does 'emerging pedagogies' mean?

In online collaborative learning, both teachers (also called instructors in a MOOC setting), and students experience a significant change, including online teaching-learning methods, new emerging pedagogical trends and the design of a research methodology that is based on a constructivist and cooperative approach among students (Contactnorth, 2020: 6-9).

According to some studies, participation tends to be viewed as positive (Bovill & Bulley, 2011: 9). Benefits include, on the one hand, the reinforcement and the improvement of the studying and learning of educational contents, and an increase in students' interest at a cognitive level. On the other hand, on a social level, students become critical thinkers (Bovill & Bulley, 2011: 3). However, "Lyotard warns us to beware of simply accepting broad, widely accepted definitions and narratives unquestioningly" (Bovill & Bulley, 2011: 9).

In order to achieve these benefits, online collaborative learning should continue down this route: (1) encouraging and enabling students and teachers in order for them to continue with this change, (2) developing reliable, strong and effective methods to achieve the above-mentioned social and cognitive benefits through online collaborative learning for all participants.

The importance of connections among academic staff and students is vital to encourage learning. When there is a social presence by all participants in the learning process, which is the basis and guide of the knowledge creation process (Mackness, Mak & Williams, 2010: 267), deeper learning takes place. When students rely on technology, the media, the topic of discussion, and the methodology, they create learning networks. Mackness, Mak and Williams (2010: 267) show a trend in growing and emerging practice. Students develop the new knowledge structures in an innovative way.

A new challenge in this kind of online collaborative learning is whether (1) the level of support, (2) the structures of an emerging and complex learning environment, and (3) the interaction of all participants, are not only provided but also suitable to assist students on their personalized learning journey (Mackness, Mak & Williams, 2010: 266).

VLEs (virtual learning environments) can offer more possibilities than physical campuses. These opportunities include the chance of greater collaboration between students and between students and teachers. Furthermore, online collaborative learning provides students with improved digital skills.

Several studies suggest that one of the most effective ways to encourage deep learning is to involve students in research activities in learning contexts based on the inquiry[8] (Brew 2006, as quoted in Neary, 2012: 5). The aim is to place students in the role of researcher, temporarily giving them more control and responsibility in the learning process. This approach is a starting point from which to generate an in-depth discussion about how the university teaches in order to cause change.

Regarding what features an online course should have, particularly in the case of a MOOC, in order to encourage student participation, there are diverse and recent literature and studies on this subject. One of these, "Open Cases: A catalogue of mini Cases on Open Education in Europe" (Lažetić Predrag et al., 2015) includes some practices, such as the following: at the university of Coventry students are encouraged to exchange knowledge and to support others through constructive feedback in different environments (Lažetić Predrag et al., 2015: 25). At the university of Potsdam discussion forums and virtual learning groups fostered an appealing and cooperative learning of the dealt topic (2015: 29). At FutureLearn (2015: 12) quizzes, tests, assignments, and tutorial support are provided. Moreover, testing has already begun to be used in some courses. In this regard, FutureLearn (2015) mentions recognition procedures as part of the procedures required to obtain a MOOC. In only five years since the publication of this study, all these procedures have become an elaborate and

[8] Inquiry based-learning: Inquiry-based learning is an approach to learning that emphasizes the student's role in the learning process. Rather than the teacher telling students what they need to know, students are encouraged to explore the material, ask questions, and share ideas. Retrieved from < https://gradepowerlearning.com/what-is-inquiry-based-learning/>. Last accessed March 6, 2021.

significant part involved in the design process of a MOOC. This is evidence that MOOCs are still in an early stage of development. These are only a few examples of good practices that reveal the importance of the design process when launching a MOOC. In addition to the factors required to ensure high student participation during the course, such as including new experimental teaching and learning formats, thematic orientations, certification, video sequences supplemented by scripts and other interactive learning tools.

Despite the previous statements about the current situation of the online learning model, many critical publications can be found, such as those emerging from the United States of America. Some opponents such as Bates (2012) (mentioned below) assert that MOOCs have been significantly diverted from their original mission. What originally set out to be a course in which connectivism was an essential requirement, in other words, where the course activity was driven by the relationships among all participants, has become on some platforms, Coursera for example, a return to a mere traditional transmission of knowledge. Cooper (2013), in his article "MOOCs: Disrupting the University or Business as Usual?" quotes Tony Bates (2012) as saying that teaching methods are based on a very outdated behavioural pedagogy, on the mere transmission of knowledge. Therefore, skills such as being critical or creative, necessary in a knowledge-based society, are not being developed during these courses.

Authors such as Daphne Koller, co-founder of Coursera argues the following, as quoted in Peng (2013):

> Sometimes I have these discussions with some people in academic institutions who say that they feel that by engaging, for example, with

> MOOCs or blogs or social media they are diverting energy from what is their primary function, which is teaching of their registered students… But I think for most academic institutions, if I had to say what the primary function of an academic institution is, it is the creation and dissemination of knowledge… The only way society is going to move forward is if more people are better educated.

In this study, I also aimed to show that MOOCs are still in an early stage of development and expansion. Although it is true that there is still much to do, I do think that they are working the right way. The number of registrations is steadily improving. Students are choosing MOOCs as an ideal opportunity to improve their lifelong training.

1.5 Synthesis of online training

New learning styles have meant that MOOCs are currently becoming in the favourite way of lifelong training. The fact that students can undertake this kind of course anytime, anywhere, is its greatest advantage. Despite some authors emphasising the fact that MOOCs are taking a step back because they have lost the primary essence by which they were created, in my opinion MOOCs allow students: (1) to access to university, which was previously very difficult, (2) to undergo training previously unthinkable for several reasons, and (3) to access affordable training (tuition fees) that open students to a new landscape of knowledge.

This project aimed to reconsider the students' role in their own learning process. The idea was to place them in a more active role in the MOOC, even positioning them as co-creators, if possible, of teaching methods, course design, and curricula. Furthermore, their participation would depend on several factors, among which it was essential that their learning process be as active as possible. This is the key to maintaining high student participation. Thus, the instructional design process of a MOOC was the focus of analysis throughout this research study.

Chapter 2. Massive Open Online Courses

The theoretical framework was designed according to the following concepts of education and ICT: (1) reviewing the current concept of online education, (2) identifying key points of teaching and learning processes, organisation, management and education policies, technological resources for learning, documentation and published articles/papers. Furthermore, design elements and a methodological perspective were analysed to optimise the development of MOOCs with the objective of satisfying the needs of students.

2.1 What are Virtual Learning Environments (VLE)?

A VLE is a virtual and a social space, where people can gather and interact. These are web-based platforms that provide an open educational environment as part of the educational system of an institution. They consist of resources, management tools, activities aimed at students, tools for interaction and group learning, if necessary. All this is provided within a course structure and, ending with an assessment (Wikipedia[9]).

[9] Virtual learning environment. Wikipedia. Retrieved from: <https://en.wikipedia.org/wiki/Virtual_learning_environment>. Last accessed November 15, 2019.

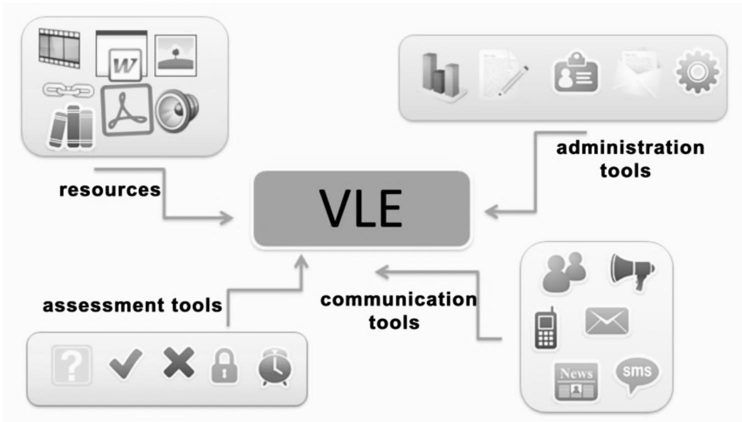


Figure 3. Virtual learning environments (McBride, 2017).

2.2 What are MOOCs? Concept and nature

From the early 21st century, MOOC is described as a "course of study made available over the internet [sometimes] without charge [fees, targeted] to a very large number of people" (Oxford Dictionaries Online).[10] Anyone who decides to participate, can access by registering simply by logging onto the website and signing up. "The term MOOC describes an evolving ecosystem of online learning environments that encompass a spectrum of course designs" (Veletsianos & Shepherdson, 2016: 1).

MOOCs have different characteristics: (1) they are massive: they can consist of more than one hundred thousand students, (2) they are open: registration is accessible to anyone around the world. The courses are usually available free of charge. If you want to receive a verified

[10]Definition of MOOCs. Oxford dictionaries Online. Retrieved from: <https://en.oxforddictionaries.com/definition/MOOC?utm_campaign=elearningindustry.com&utm_source=%2Fthe-definition-of-a-mooc&utm_medium=link. > Last accessed May 10, 2018.

certificate, in some cases a small fee is required. Nowadays, fees are usually affordable, (3) they are online: the course is set entirely online. For this reason, the tasks can be performed anytime and anywhere. In addition, courses may be an arrangement of streaming videos, discussion forums, written and interactive online material, and (4) they are courses, and offer a full course experience (Wikipedia).[11]

2.2.1 Classification of MOOCs

The synthesis of the literature on MOOCs revealed that there are many researchers who have attempted to classify and analyse this literature into different perspectives, such as Ebben and Murphy (2014), Hew and Cheung (2014), Jacoby (2014), Kennedy (2014), and Liyanagunawardena, Adams, and Williams (2013), all of whom are quoted in Veletsianos and Shepherdson (2016: 24). The most important issues these scholars raise, are: (a) the impact of MOOCs on education, (b) the difference between cMOOCs and xMOOCs, and (c) challenges facing MOOCs.

2.2.1.1 The impact of MOOCs on education

Over the years, MOOCs have been evolving and adapting to the needs of the target public. Universities have invested much time and money, making great efforts in producing MOOCs. These courses began only as training that had the support of technology, but currently,

[11] Retrieved from: <https://en.wikipedia.org/wiki/Massive_open_online_course>. Last accessed November 20, 2019.

MOOCs have turned into a new concept of education, providing new possibilities for training and the best outcomes for learners.

The significant and disruptive impact that MOOCs have had on education is undeniable. It is highlighted by Kennedy (2014) who claims that MOOCs "disrupt conventional thinking about the role, value, and cost of higher education" (Kennedy, 2014, cited in Veletsianos & Shepherdson, 2016: 200). Ebben and Murphy (2014) refer to students as participants and propose that MOOCs could involve a decrease in the control and the significance of the instructor, coach or facilitator (Ebben & Murphy, 2014, cited in Veletsianos & Shepherdson, 2016: 200). Furthermore, I think that Jacoby's assertion is very interesting: she discusses the effect that MOOCs may have on the business models of universities (Jacoby, 2014, as cited in Veletsianos & Shepherdson, 2016: 200).

A great deal of information can be found in institutional reports. Authors such as Ebben and Murphy (2014) assert that official reports describe MOOC users as characterised by: (a) they originate from many different countries, (b) most of them are male (c) they are between the ages of 20 and 40, and (c) they have earned a college degree or higher (2014: 338). But Ebben and Murphy (2014) found other reports in which more than half the students enrolled in MOOCs were from countries other than the United States. In contrast, Liyanagunawardena et al. (2013) mention that "a large majority of participants were from North America and Europe[], with a small minority being from Asia, South East Asia, or Africa" (Liyanagunawardena et al., 2013, cited in Veletsianos & Shepherdson, 2016: 201). Technology and language could be the main reasons for this trend.

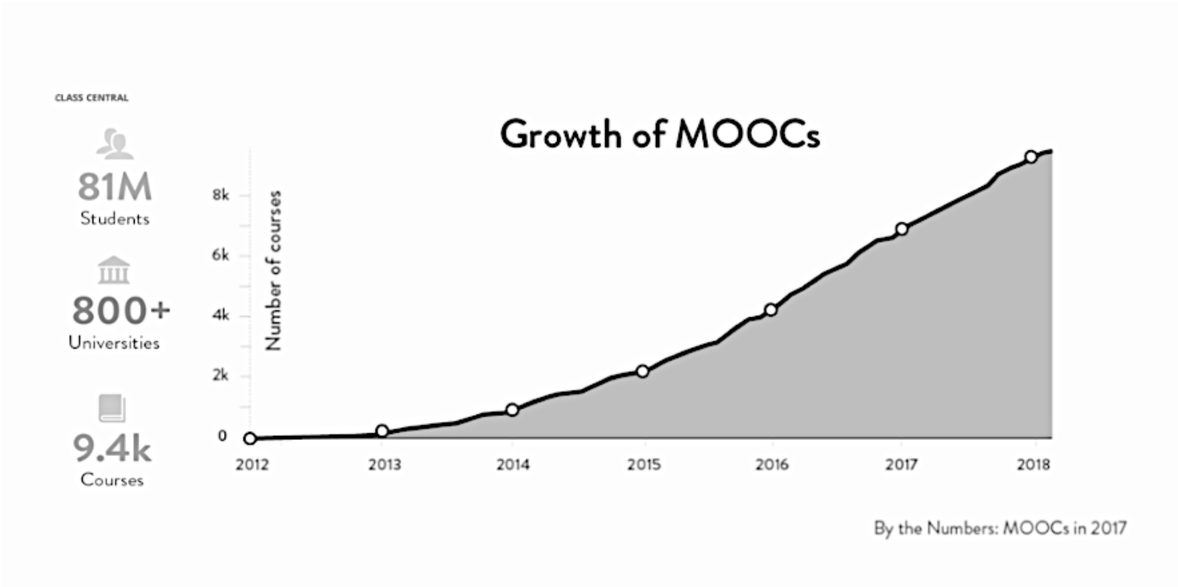


Figure 4. Growth of MOOCs in recent years (Shah, 2017).

The graphic shows how the number of available MOOCs has increased in the past few years.

Currently, MOOCs are provided as new options for training; in addition, however, they are assumed to improve the business models of universities. Thus, they are interesting for institutions.

Wong et al. (2016: 106)

> …surveyed the motivations […] for institutions in offering MOOCs. Their findings showed that educational advancement is one major motivation for institutions; and that the implementation of MOOCs in traditional education improved students' learning performance, and helped new students to catch up with their university courses[…].

Urrutia et al. (2015, as quoted in Wong et al. 2016: 106-107) explain that institutions are using MOOCs as a

> strategy for keeping up with Higher Education evolution. Some institutions were involved in offering MOOCs in order to advance teaching practices, showing their need to keep abreast of developments in this area, in particular those related to ways of effective MOOC delivery.

In spite of some experts talking about a democratisation of education with the arrival of MOOCs, others think that the quality of learning is not comparable to traditional learning, “and that MOOCs are [only], at least for now, another resource for learning” (Hew, 2015: 322). However, MOOCs are like a breath of fresh air for the field of education. They are a new way of teaching because the conditions have changed in comparison to traditional training. In a constantly changing society, educational institutions, especially higher education institutions, must meet the ever-changing needs of students entering the professional world.

2.2.1.2 The difference between cMOOCs and xMOOCs

cMOOCs are described as being

> based on principles of connectivism, openness and participatory teaching”[…] and (emphasizing) human agency, user participation, and

> creativity through a dynamic network of connections afforded by online technology (Veletsianos & Shepherdson, 2016: 199).

xMOOCs are described as

> follow[ing] a cognitivist-behaviorist approach […] and resemble[ing] traditional teacher-directed course[s], yet automated, massive, and online. (Veletsianos & Shepherdson, 2016: 200).

MOOCs originally tended to be cMOOCs, whereas the number of xMOOCs has currently been growing. As these definitions indicate, the two main differences between them are: (a) the concept of openness, and (b) the instructor/coach's role (Veletsianos & Shepherdson, 2016: 200).

a) Openness is a concept related to transparency, course delivery, access to courses, course content, the manner of instruction and how the assessment is performed (Veletsianos & Shepherdson, 2016: 200).

b) The two types of MOOC differ with regard to the instructor/coach's role, specifically on the matter of who completes the course's content. In xMOOCs the instructor/coach provides the course content, whereas in cMOOCs the content is provided by students (Veletsianos & Shepherdson, 2016: 200).

Therefore, MOOCs are defined as:

> MOOCs as an evolving ecosystem of online environments featuring open enrollment, characterized by a spectrum of course designs ranging from networks of distributed online resources (cMOOCs) to structured learning pathways centralized on digital platforms (xMOOCs) (Veletsianos & Shepherdson, 2016: 200).

2.2.1.3 Challenges facing MOOCs

The main challenge that MOOCs will have to overcome lies in the completion rates of MOOC learners. Ebben and Murphy (2014, as quoted in Veletsianos & Shepherdson 2016: 201) mention that the completion rate is generally less than 10%. This could be influenced by the fact that the participation in a MOOC is free, and learners only participate in the parts in which they are interested.

Hew and Cheung (2014, as quoted in Veletsianos & Shepherdson, 2016: 201) provide some reasons for non-completion:

> a lack of incentive, insufficient prior knowledge (e.g. lack of math skills), a lack of focus on the discussion forum (e.g. off-track posts), failure to understand the content and (having) no one to turn to for help, ambiguous assignments and course expectations, and a lack of time due to having other priorities and commitments to fulfil.

Shah (2017a) published an article in Class Central, reporting on a survey he conducted with their users. He found that 61% of survey respondents were able to identify tangible benefits of taking a MOOC. Among these were: (1) higher performance evaluation at their current job, (2) the possibility of getting a new job, (3) getting a new job, but in a different field, (4) achieving a school credit towards a degree, and (5) a promotion at a current organisation.

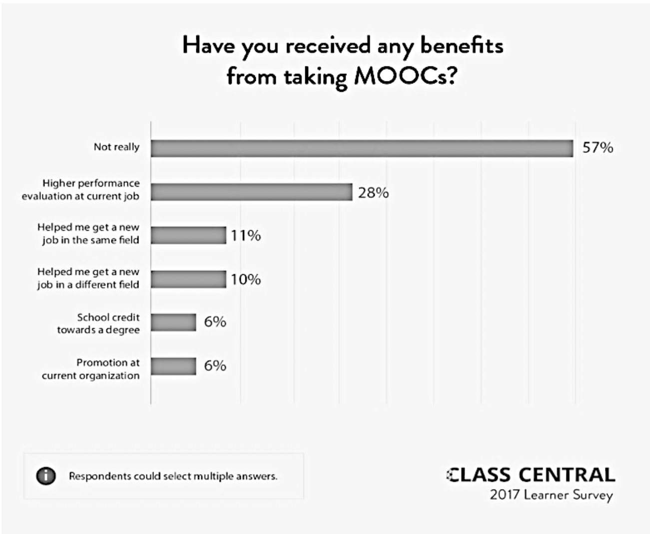


Figure 5. Have students received any benefits from taking MOOCs? (Shah, 2017a).

An interesting aspect that this survey included was how the learners decided which MOOCs to enrol for. In my view, this is a meaningful aspect which should be considered when investigating why MOOCs continue to have high dropout rates.

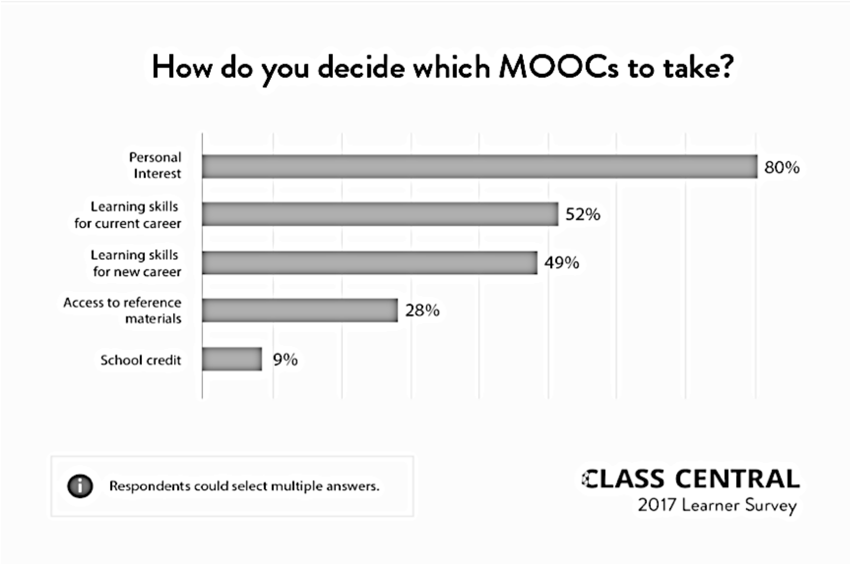


Figure 6. How students decide which MOOC to take (Shah, 2017a).

As represented in the previous graph, students' focus is not on receiving a certificate for the courses in which they are enrolled. The most important aspect is the contents of the course. In other words: (1) knowledge, (2) interaction with a global community, and (3) accessing free education from the best universities in the world.

In any case, reducing attrition rates is the main aim of universities offering MOOCs. Therefore, improving platforms by making them more interactive and more communicative has the aim of encouraging active learning (Veletsianos & Shepherdson, 2016: 201).

Another important hurdle that MOOCs have to overcome, is the viability of courses. Are MOOCs a viable business model? Offering a MOOC includes significant costs. They require: (1) a technological infrastructure that is attractive and interactive, and (2) a full team to create and manage the MOOC. Furthermore, MOOCs have limitations related to mass teaching methods (Kennedy, 2014, as cited in Veletsianos and Shepherdson, 2016: 201), accreditation

(Liyanagunawardena et al., 2013, as cited in Veletsianos and Shepherdson, 2016: 201), and the evaluation of complex writing such as essays (Ebben & Murphy, 2014, as cited in Veletsianos and Shepherdson, 2016: 201). All these aspects must be considered by universities when conducting a viability study with the goal that MOOCs are a long-term project.

To summarising, as in any business, universities must ensure that: (1) they offer a new service of quality to students, (2) this innovative way of training is viable, and (3) moreover, that it is interesting and particularly appealing.

2.3 Synthesis of massive open online courses

Veletsianos and Shepherdson (2016:199) observe that between 2013 and 2015, there was evidence of large empirical research studies on MOOCs, from articles in professional journals in diverse disciplines to conferences and workshops focusing particularly on MOOCs. These researchers determined that (a) most of these studies were undertaken in North America and Europe, and (b) researchers preferred to collect data via surveys and automated methods, in other words, using quantitative methods rather than qualitative methods. Thus, one can find few studies that have used qualitative research methods (e.g. interviews, focus and groups, and observations). “While the MOOC phenomenon has been subject to numerous interpretations in the mass media […], researchers currently lack a systematic synthesis of the empirical literature published on the topic. A collective research effort is required to fully understand the impact of MOOCs” (Veletsianos & Shepherdson, 2016: 199). In the past few years, MOOCs have helped us to reflect on what we do in the classroom. They offer a new approach to teaching and learning. MOOCs are a breath of fresh air for education. For this reason, my research is focused on this topic in a bid to provide a systematic analysis and synthesis of this new mode of training, MOOCs.

Chapter 3. An approach to the MOOC design process: Meaningful concepts

As an introduction to this section, the definition of instructional design is indicated below as this process covers various relevant aspects that should be considered in the process of launching a MOOC:

> Instructional Design (ID), also known as instructional systems design (ISD), is the practice of systematically designing, developing and delivering instructional products and experiences, both digital and physical, in a consistent and reliable fashion toward an efficient, effective, appealing, engaging and inspiring acquisition of knowledge. The process consists broadly of determining the state and needs of the learner, defining the end goal of instruction, and creating some "intervention" to assist in the transition. […] There are many Instructional Design models but many are based on the ADDIE model with the five phases: analysis, design, development, implementation, and evaluation.[12]

In accordance with the literature, ID is the basis of educational technology, as it is essential in online education in order to carry out systematic planning. ID is the design process of a course that focuses and identifies the following aspects in order to determine the particular requirements of a course should have: (1) to meet the students' needs, (2) to determine the goals and objectives of the training, (3) to plan and to design the teaching and

[12]Wikipedia. Retrieved from: <https://en.wikipedia.org/wiki/Instructional_design>. Last accessed Mach 24, 2020.

learning assignments, and (4) to establish how to assess the achieved and assimilated knowledge (Kurt, 2017).

The current trend in the design process of products and services is to be closer to the user. This evolution has caused a huge shift in current design practice (Dunne, 2018). Thus, the closer the ID is to students, the better the outcomes universities will achieve from their courses.

In this study, I focused on the design process of MOOCs, particularly on the design phase, one of the five significant phases of the process (analysis, design, implementation, realisation, and evaluation), according to QRF.[13] The design phase was evaluated: 1) through the observation of courses via the website, 2) the data that institutions provided and 3) various studies and publications.

In more detail, ID is the systematic planning of a teaching and learning process that is tailored to students' needs and is concerned with the development of effective learning experiences and environments (Kurt, 2017). "Garrison and Cleveland-Innes (2005) found that online course design and the pedagogical approaches selected influence participant learning and online interaction" (Zhu, Bonk & Sari, 2018: 204).

> Branch and Dousay (2015) reviewed 34 different instructional designs and argued that the following models were appropriate for online environments: (1) Dick and Carey (2008); (2) Bates (1995); (3) Dabbagh and Bannan-

[13] Quality Reference Framework (QRF). Retrieved from <http://mooc-quality.eu/wp-content/uploads/2019/11/Quality_Reference_Framework_for_MOOCs_v11.pdf>. Last accessed January 15, 2021.

> Ritland (2004); and (4) Morrison, Ross, Kemp, Kalman, and Kemp (2012). All of these models are related to the most popular design processes (Dousay, 2018), including analysing, designing, developing, implementing, and evaluating (ADDIE; Gustafson & Branch, 1997). (Zhu, Bonk & Sari, 2018: 206)

With reference to online education, there is no consensus in the literature on which of these models are most suitable for creating and launching a MOOC. Regardless, and considering the QRF, which I used as a benchmark in this study, ADDIE was the model selected. However, this is a topic that is developed further in this thesis, specifically in the following section (4.3). 'Instructional Design process of a MOOC using an ADDIE model', in chapter four.

There are two relevant concepts to consider in the design process of a MOOC:

- Co-creation
- Active student participation

3.1 Co-creation. An introduction to co-design

As mentioned above, the current trend in the design process of products and services is to be increasingly closer to the user. This is key to being successful in whatever business if a company wants to reach its users. Therefore, the trend is to focus on a user-centred approach and co-design.

Co-design refers to the collective creativity of collaborative designers. We use the term co-design in a wider context when we talk about the innovation and creativity of designers and non-professions in the design field working together in the design development process (Sanders & Stappers, 2008: 6).

The current co-design process is shown in the figure below. The first part of the process, called "pre-design" or "fuzzy front end" is the most significant. The aim of this stage is to report and to inspire open-ended questions about the area of study which require answers. This most critical phase is characterised by its uncertainty and its disorganised nature. The aim of this investigative phase is to determine what it is going to be designed (Sanders & Stappers, 2008: 7).

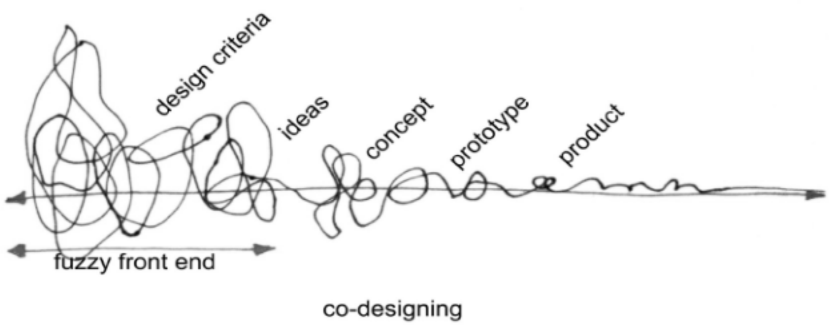


Figure 7. Co-design process (Sanders & Stappers, 2008: 6).

As can be seen in figure 7, the front end of the design process has been growing as designers move closer to the future users of what they design.

The traditional process is preceded by the fuzzy front end or "brainstorming" stage. Here the resulting ideas of the product, service or interface, are developed in two steps: Firstly, the concept is developed, and then the prototypes are developed and enhanced according to feedback from future users (Sanders & Stappers, 2008: 7).

The implementation of participative design practices, both during brainstorming and during the whole design process, is key for the moment of decision. This practice has shifted the whole concept of design. The outcome of the process is more likely to be successful among users, as it has been developed according to the needs of an increasingly demanding target audience who have also participated in the design process (Sanders & Stappers, 2008: 9).

3.1.1 What does co-creation in the design practice in the field of education mean?

When we talk about co-creation in the design process, we must consider different aspects: the manner of designing, what is designed, who designs, and also the tools involved and the methods used by co-designers (Sanders & Stappers, 2008: 15).

With reference to the co-design process, particularly, Sanders and Stappers (2008: 15) argue that

> At the front end, design will become synonymous with design research, creating new landscapes of opportunity for designers and researchers. The fuzzy front end will become populated with hybrid design researchers and research designers. [ ] In practice we now see industrial designers with many

years of experience in product development who are moving into new roles as design researchers.

The future of co-design will comprise close cooperation among all parties in the design development process. Moreover, there will be a variety of professionals from many different types of cultures (the disciplinary culture, the culture of the company, ethnic culture, a way of thinking about the world, etc.) working at the same time on the design and on research. Any of these aspects might change what is being designed. In addition, new tools and methods will be required for the research design with the aim of increasing the breadth, the purpose, the size and the complexity of what is designed (Sanders & Stappers, 2008: 16).

The implementation of co-design tools and methods in the design of learning and institutional environments is in its early stages currently. The fact is that the current shifts in students' learning styles suggest a change in the active construction of knowledge. This view suggests that an interesting and an innovative way of learning is approaching (Sanders & Stappers, 2008: 15). Despite this, the most common way of teaching and learning in the MOOC area is currently a cognitivist-behaviourist approach; in other words, xMOOCs. This study investigates whether online training, particularly MOOCs, includes these practices in its processes.

3.1.2 New practices of cooperative creativity

In the framework presented by Sanders and Stappers (2008: 16), there are new practices in new areas of cooperative creativity. For instance, new aspects of design in the areas of architecture and health care environments (based on observations of best practices) are explored. This is a highly complex field, where the introduction of co-design has been very well received by many health professionals (2008: 16).

In the educational field, these practices require other innovative learning actions and new curricula for those who are designing and establishing new structures to encourage cooperative creativity in the learning process. These new curricula or learning programmes will help people to learn that the best way to work and learn is by brainstorming. There are many questions that will have to be addressed by the various parties in the cooperative creativity process, according to Sanders and Stappers (2008: 16-17):

- What is the best learning style for students in the new practice of cooperative creativity? Firstly, beginning with the traditional design process or alternatively, with the innovative one?

- What happens in the learning process in the field of social sciences? Is it easier to follow a co-design learning process in the social sciences or hard sciences? What implications would this have for the future?

- What would be the impact of the implementation of cooperative creation? How will it influence design cultures? What influence could it have on the cultures of the world?

In the forthcoming years, experience may be valued more than theory. This is reflected in the rapid proliferation of virtual experiences on the internet. As Sanders and Stappers (2008:

17) explain, we will, of course, increasingly design in virtual environments. However, we still have a long way to go. Design research will focus on the user in a virtual world, a world which grows and shifts every day. From my viewpoint, I absolutely agree with this. However, the reality is that co-design might be utilised in the future as good practice or a tool when institutions realise that they need other ways to improve their students' participation rates. All this requires a process of adaptation and evolution in preparation for the moment at which the online workload of institutions is as important as face-to-face training. Currently, we are in the throes of this change.

3.1.3 Roles in the design process

As mentioned above, new design and research is shifting. The change from a user-centred design to a co-design model is also exerting an impact on the roles of each actor who participates in the design process (Sanders & Stappers, 2008: 5). In addition, of course, this has consequences for the results of, in this case, the learning process. Thus, effective interactive teaching and learning is a concept to consider. This point is developed later in this thesis.

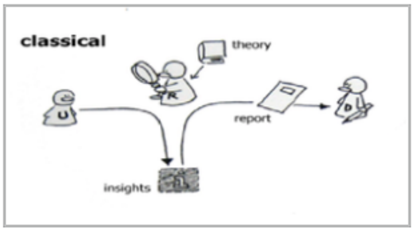


Figure 8. Classical sources of users, researchers, and designers in the design process (on the left) and how they are merging in the co-designing process (on the right) (Sanders & Stappers, 2008: 11).

The concepts developed in the following table are retrieved from Sanders and Stappers (2008:11). This assists in understanding the benefits of co-design when compared to user-centred design.

Table 1. A comparison of the user-centred design process and co-design

User-Centred Design Process	Co-Design
The user is a passive learner	In the co-design, roles are fluid, and people involved are experts in their own experiences, each playing an important role in the development of knowledge, the generation of ideas and concept development.
The researcher provides the knowledge of theory. He also develops and creates more knowledge through observation and interviews.	In the generation of ideas, the researcher provides tools for conception and expression.
The designer will receive all the knowledge of technology and creative thinking from the researcher to generate ideas, concepts, etc.	The designer and co-researcher cooperate in using tools for conception. They may be the same person. The designer plays a key role in shaping ideas.

Note: Data are from Sanders and Stappers (2008:11).

As indicated above, in the process of co-design the role of user takes on particular importance when compared with the other model. In co-design, users have more power, and from their experience can provide interesting knowledge to experts (designers and co-researchers). These individuals then have the role of providing tools to users to develop another perspective from the final users of the product they wish to develop.

Sanders and Stappers (2008: 12) list the three roles in co-design as:

3.1.3.1 The role of the user: Co-designer

Sometimes, we can say that the user is also the co-designer in the design process, depending on the user's level of experience, passion and creativity. Although all people may be creative at any time, not all of them can be designers. There are four levels of creativity: (1) to do, (2) to adapt, (3) to carry out and (4) to create. These four levels may shift according to the amount of knowledge and the interest of the user (Sanders & Stappers, 2008: 12).

Level	***Type***	***Motivated by***	***Purpose***	***Example***
4	*Creating*	*Inspiration*	*'express my creativity'*	*Dreaming up a new dish*
3	*Making*	*Asserting my ability or skill*	*'make with my own hands'*	*Cooking with a recipe*
2	*Adapting*	*Appropriation*	*'make things my own'*	*Embellishing a ready-made meal*
1	*Doing*	*Productivity*	*'getting something done'*	*Organizing my herbs and spices*

Figure 9. Four levels of creativity (Sanders & Stappers, 2008: 12).

Users can take part in the design team as an expert in their own experiences. Thus, it is important to provide them with appropriate tools so that they can express themselves. In recent years, research groups at academic institutions have explored the different tools, techniques and processes of co-design (Sanders & Stappers, 2008: 12).

3.1.3.2 The role of the researcher: from translator to facilitator

Sanders and Stappers (2008: 13) describe the role of the researcher in their paper. They compare this role in the traditional design process to the role in the co-design process. In the traditional process, the researcher plays the role of translator between "users" and “the designer”. On the other hand, in co-design, the researcher (who may also be a designer) assumes the role of facilitator of tools and techniques. Some of these, which come from recent personal experiences of authors, are illustrated below (2008:13). These tools and techniques are useful when the user takes on the role of expert. This photograph shows a technique of presentation using a TV frame that can help shy people to express their opinions more easily.

Figure 10. A technique of presentation with a TV frame (Sanders & Stappers, 2008: 13).

The following photograph shows nurses co-creating a concept of an ideal workflow on a patient's floor. Components of the toolkit are arranged in a circle, which helps the participants to think in terms of activities. This session leads on to the following figure.

Figure 11. Nurses co-creating a concept of an ideal workflow on a patients' floor (Sanders & Stappers, 2008: 13).

The following picture shows nurses co-designing the future ideal patient's room using a set of tools for the creation of a three-dimensional prototype.

Figure 12. Nurses co-designing the future ideal patients' room (Sanders & Stappers, 2008: 14).

When these four levels of creativity (figure 9) have been recognised, it is important to provide meaningful experiences to facilitate the expression of the users' creativity. Therefore, the researcher has the task of leading, guiding and providing structures from 'clean blackboards' to encourage users to display and to express their creativity. Thus, his task is to bring people together during the design process in order to make them more effective and efficient in their participation. The researcher can also contribute with his prior knowledge, taking into account the outlines and factors that could guide the process and inspire the design (Sanders & Stappers, 2008:14).

3.1.3.3 The role of the professional designer

Considering the role of future users in co-design, we ask ourselves: what role will professional designers have during co-creation of new products and/or services?

Sanders and Stappers (2008:15) explain that designers have the essential skills that should be implemented during the process of the design of a product or service at a global level. This is because they have suitable training in visual thinking, the implementation of creative processes, the search for missing information, and the ability to take fundamental decisions. In other words, they provide specialised knowledge in new and emerging technologies, and they have a general overview of the production processes and business contexts. Thus, professional designers are essential in the design of both stand-alone products and environments. They are key in the creation process and in research on new tools and methods for creative design thinking. They may even develop new tools and methods for use by non-designers, in a bid to help them to express themselves creatively. The aim is to enhance the final product or service.

3.1.4 Synthesis of co-creation

Participative design (originally called co-operative design, now often co-design) is an approach to design in which all participants (e.g. employees, partners, customers, citizens, and users) engage actively in the process. The aim is to ensure that the final result (product or service) meets their users' needs and is functional.

> [This] approach is highlighted because is focused on processes and procedures of design […]. The term is used in a variety of fields, e.g. software design, urban design, architecture, landscape architecture, product design, sustainability, graphic design, planning, and even medicine, as a way of creating products and environments that are more responsive and appropriate to their users' cultural, emotional, spiritual and practical needs.[14]

In terms of higher education, the student and the instructor or coach need to reach an agreement about their respective roles in the design process. This is a difficult task, because instructors are not always allowed to listen to students' opinions. However, this way of working is helpful in detecting weaknesses in the learning process. This is a useful method to understand the best way to deliver effective teaching and learning through good practices.

Thus, on the one side, instructors can provide effective learning contents and tools so that students learn better. On the other hand, students need to engage by choosing the most appropriate learning methods when using this learning content. These are the main benefits of

[14] Participatory design. Retrieved from: <https://en.wikipedia.org/wiki/Participatory_design>. Last accessed May 13, 2018.

an agreement building process in co-creation, where the major aim is to ensure that the learning process is the most suitable one for a specific group of students.

3.2 Students as co-creators

Catherine Bovill, Alison Cook-Sather and Peter Felten (2011: 2) demonstrated in their paper, “Students as co-creators”, the theoretical background for including students into the pedagogical design processes of learning methods, the course design, and curricula. Three examples they provide are explained later.

Mihans, Long and Felten (2008, as quoted in Bovill, Cook-Sather & Felten, 2011: 3) argue that “some teachers are so focused on doing things for themselves, that they do not pay attention to their students, who are the most valuable resource in a class". Bovill, Cook-Sather and Felten (2011: 1) also assert in their paper that although students are an essential source to continually improve learning processes, they are seldom consulted for their educational experiences.

In the online area, particularly in MOOCs, ‘students as co-creators’ is a concept increasingly available to students as a tool to improve different aspects of the learning process where instructors have to be closer to students owing to the characteristic of it being distance learning. However, and according to the literature about students’ engagement levels, it should be used not only to consult students, but also to explore different ways for students to participate actively in the design of teaching methods, courses and curricula (Bovill, Cook-Sather & Felten, 2011:1).

In this way, teaching staff remain apart from the traditional hierarchical models of knowledge. In fact, they require students to be actors in the transformative learning process by providing a theoretical basis for potential improvements. Bovill, Cook-Sather and Felten (2011:1) also describe three different ways in which students can participate in educational planning.

Figure 13. Students' voice (Abulencia Gabiola, 2015).

The student's commitment is considered essential for effective teaching and learning, and, of course, for student success in higher education. Student engagement is an added value that makes them feel more responsible for their own learning. As Bovill, Cook-Sather and Felten, (2011:1) explain in their paper, in almost all definitions of participative or collaborative learning, students take an active role in the learning process (Wolf-Wendel, Ward & Kinzie, 2009, as cited in Bovill, Cook-Sather & Peter Felten, 2011: 4), in order for them to become co-creators of learning (Davis & Summara, 2002; McCulloch, 2009, as cited in Bovill, Cook-Sather & Peter Felten, 2011: 4). The adoption of this active and participatory role in learning is intended to improve processes and learning outcomes (Kuh, 2008, as cited in Bovill, Cook-Sather & Peter Felten, 2011: 4).

The student voice positions students as active participants in the educational learning process. This approach has been developed as good practice in school settings in the United Kingdom, Australia, Canada and the United States. In such practices, students should be invited to share their points of view, which not only deserve the educators' attention but also a response (Fielding, 2001 and Rudduck, 2007, cited in Bovill, Cook-Sather & Felten, 2011: 2). Hattie (2008, as cited in Bovill, Cook-Sather & Felten, 2011: 2), explain that learning is deeper (1) when students become their own teachers because they feel more involved and responsible and also, (2) when teachers learn from their students through feedback and other means.

"Students' proposals in higher education to collaborate on the educational planning are not new" (Dewey, 1916, as quoted in Bovill, Cook-Sather & Felten, 2011: 4). Students often do not have the skill to carry out it within the university's educational structures and processes because of their lack of proper knowledge. In contrast, "positioning the students as [classmates] who have valuable perspectives" (Sorenson, 2001, as quoted in Bovill, Cook-Sather & Felten, 2011: 4) "is key to support the relations between [teachers and students, with the goal of identifying] and improving the practices in the classroom" (Cook-Sather, 2010, as quoted in Bovill, Cook-Sather & Felten, 2011: 5). It is important to highlight that students' participation, which is used to improve educational planning, is not a substitute for the teaching experience that plays a key role in facilitating learning (Breen & Littlejohn, 2000, as quoted in Bovill, Cook-Sather & Felten, 2011: 5).

Despite there being diverse benefits to be had from students' participation in pedagogical planning, some researchers have reservations. Participative approaches run the risk of not questioning students' opinions (Cooke & Kothari, 2001: 3, as quoted in Bovill, Cook-Sather

& Felten, 2011: 3). This may lead some to consider students' opinions unconditionally, regardless of the nature of different existing points of view (Silva & Rubin, 2003; Shor, 1994, as quoted in Bovill, Cook-Sather & Felten, 2011: 3). In addition, one should consider that students' requests to participate in the learning process are not always on their own initiative. Consequently, in this kind of participation, students remain as outsiders. In other words, the co-creation may be a threat to students who are accustomed to teachers who dominate and guide the class. Therefore, they may be resistant to deviating from this teaching strategy (Shor, 1992, as quoted in Bovill, Cook-Sather & Felten, 2011: 3).

3.2.1 Three types of student participation in pedagogical planning

These three types of student participation in pedagogical planning were developed as good practices in different contexts such as a small liberal arts college[15] in the United States, a mid-size liberal arts college in the United States, the large National University of Ireland, and in a small university "post-1992"[16] in Scotland.

[15] A liberal arts college is a college with an emphasis on undergraduate study in the liberal arts and sciences. A liberal arts college aims to impart a broad general knowledge and develop general intellectual capacities, in contrast to a professional, vocational, or technical curriculum.[1] Students in a liberal arts college generally major in a particular discipline while receiving exposure to a wide range of academic subjects, including sciences as well as the traditional humanities subjects taught as liberal arts. Although it draws on European antecedents,[2] the liberal arts college is strongly associated with American Higher Education, and most liberal arts colleges around the world draw explicitly on the American model. Retrieved from <https://en.wikipedia.org/wiki/Liberal_arts_college>. Last accessed May 13, 2018.

[16] Post-1992 universities: The term new universities has been used informally to refer to several different waves of new universities created or renamed as such in the United Kingdom.[1] Currently, the term is synonymous with post-1992 universities and sometimes modern universities, referring to any of the former polytechnics, central institutions or colleges of Higher Education that were given university status by John Major's government in 1992. Retrieved from <https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/New_universities_(United_Kingdom).html>. Last accessed on May 13, 2018.

a) Students as co-creators of teaching/learning methods

The first good practice described is called Students as Learners and Teachers (SaLT). This new teaching and learning plan was carried out at Bryn Mawr College located in Pennsylvania. This programme invites teachers and students to participate in reflective dialogue about what is happening and what could be happening in higher education classrooms. The goal of this programme is to set the goals and plans for the semester.

Through this practice, the head researcher, who is usually also the teacher and the students-as-researchers participate in a "self-reflection cycles spiral". This entails a) the planning of a change, b) its implementation and c) the observation of its consequences. The aim is to reflect on these processes and consequences, and re-plan, if necessary (Kemmis & Wilkinson, 1998: 21, as quoted in Bovill, Cook-Sather & Felten, 2011: 5).

The main analysis methods are constant comparison and “grounded theory” (Creswell, 2006, as quoted in Bovill, Cook-Sather & Felten, 2011: 5).

Detailed description of the process:

SaLT consists of two interrelated discussion forums by the faculty (Bovill, Cook-Sather & Felten, 2011: 3):

(1) A biannual seminar that includes meetings of two hours each week, including posts to a closed blog (with access to invited users only) with feedback, and feedback at the end of the semester. Finally, a portfolio is developed.

(2) An association with a student adviser. Since 2007, the SaLT has provided support to 108 faculty members. This includes newcomers to those members with over 45 years of teaching experience, as well as 57 undergraduate student advisers working in the second to the fourth grades. All members come from different university fields, with different profiles, and different levels of education. In total, there are 137 associations.

Figure 14. Peer teaching (Briggs, 2013).

(Bovill, Cook-Sather & Felten, 2011: 3). Students are not registered for courses in which they have the role as advisers. Each student-as-adviser meets with the faculty member to set goals and plans for the semester. (1) He/she attends one class session each week, takes notes of observations, identifies the professor's pedagogical topics, undertakes surveys and/or interviews with the students in class, and if necessary for the faculty, meets weekly with the professor to discuss the observation notes, other opinions, and implications. (2) In addition, he/she participates in weekly meetings with other student advisers and with the coordinator of the SaLT. Finally (3), he/she attends one or more professors' seminars five times during the semester.

The students-as-advisers and professors strengthen partnerships outside the normal student-professor relationship. Together they explore dimensions of teaching and learning that are not usually discussed outside courses. In addition, they act as a model for the whole community that consists of a form of collaboration which challenges: (1) the existing differences in comparison with traditional roles (student/teacher), and (2) the idea of who is responsible for the teaching process that takes place in university classes (Cook-Sather, 2010, as quoted in Bovill, Cook-Sather & Felten, 2011: 3).

b) Students as co-creators of course design

In spite of a significant part of the development process in the educational field focusing on educational technique, course design may be one of the most important aspects to consider when ensuring the quality of the teaching and learning of a course in higher education (Fink, 2003, as quoted in Bovill, Cook-Sather & Felten, 2011: 4).

Since 2005, at Elon University[17] North Carolina, professors, students and the university staff have experienced a variety of methods to co-create and re-create a subject curriculum, using 'course design teams' (CDT). Elon University uses the constant comparison method and grounded theory design as methods of analysis (Bovill, Cook-Sather & Felten, 2011: 4).

[17] Elon University: <https://www.elon.edu/home/>. Last accessed May 15, 2021.

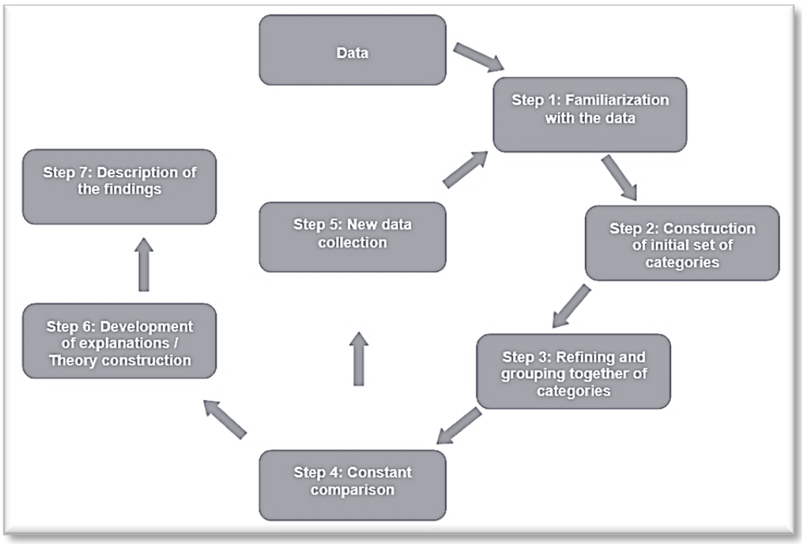


Figure 15. Grounded theory design - Constant comparative method (Kohn & Christiaens, 2012: 44).

The members of each CDT change. In general, they include:

- one or two professors,
- between two and six university students (college/undergraduate students), and
- one academic developer from the university staff.

Process:

Professors begin the redesign process by inviting students and academic development staff to co-build a team. The CDT uses an approach of "backward design" (Wiggins & McTighe, 2005, as quoted in Bovill, Cook-Sather & Felten, 2011: 4). Initially, this group develops the course objectives, and in a second step, builds the pedagogical strategies and learning assessments on the foundation of these objectives. Time is the most important element in the success of a CDT. Teams usually meet weekly over a period of two or three months, which provides them with many opportunities. This entails among other things: (1) achieving the practical purpose of CDTs, which is the redesign of the course, and (2) less importantly, developing a strengthening partnership that welcomes the voice of the students. Despite this, students sometimes doubt that they will be taken seriously throughout the process. Furthermore, they also need time to develop the language and the confidence to express pedagogical ideas clearly. At this point, many CDTs experience a key moment when all participants recognise that an essential limit has been crossed, both by a faculty member who gives up significant authority for the course design, and by students who claim power in the process (Bovill, Cook-Sather & Felten, 2011: 4).

c) Students as co-creators of curricula

The co-creation of curricula means that students and academic staff work together to create some or all the aspects of planning, implementation and assessment of the learning experience. A recent research project examined the role of students as co-creators of first-year curricula in countries such as the USA, Ireland and Scotland (Bovill, 2009, as quoted in Bovill, Cook-Sather & Felten, 2011: 4). The example from the USA was based at Elon University, and the remainder (Ireland and Scotland) are discussed below.

> At University College Dublin (Ireland), programme co-ordinators redesigned the first-year geography curriculum in collaboration with students. The programme enrols approximately 400 students each year. The co-ordinators advertised for four third-year students to apply for the job of co-designing the curriculum with existing academic staff. (Bovill, Cook-Sather & Felten, 2011: 4)

Students who were paid, produced written, audio and video resources for the virtual learning environment available for first-year students, and identified good student practices. All these contributions were meaningful in creating the curriculum.

At the Queen Margaret University in Edinburgh, Scotland, the academic staff created a degree programme in Environmental Justice. Approximately 16 students who had some experience as community activists were enrolled in the course in order to learn ways to improve their skills as activists within their own community. A curricular framework was designed by the academic staff; they established two modules, science and law. The content of the modules depended on what students needed to learn to be more active citizens, such as legislation and science in relation to toxic waste. As a result, students and academic staff developed their negotiation skills through debate, commitment and their agreement on curricular decisions. These procedures helped students to recognise that they were being taken seriously and that their participation was significant and not merely symbolic (Bovill, Cook-Sather & Felten, 2011: 5).

These examples of co-created curricula were researched using the case study methodology. The coordinators and the academic staff were interviewed. Informal meetings with students were arranged and a document analysis of the key programme was carried out. This analysis consisted of identifying and choosing the most relevant subjects (Creswell, 2006, as quoted in Bovill, Cook-Sather & Felten, 2011: 5). In the end, interesting findings were shared from the respective studies, and the common points were selected. Finally, the benefits which occurred most frequently from the studies were identified (Bovill, Cook-Sather & Felten, 2011: 5).

3.2.2 Synthesis of students as co-creators

The previous examples from Bovill, Cook-Sather and Felten (2011: 5) demonstrate the complexity of involving students in pedagogical design processes, as this implies, for example, the need to redesign pedagogical planning each year. This is done with a new cohort of students, with the goal of achieving the same sense of student ownership of their learning and of course, the same degree of ownership.

After a systematic analysis of these examples, the most common benefits in all three studies were identified. Thus, the benefits of involving students in pedagogical planning were found to be:

1) implications of deeper learning for both students and academic staff. Thus, according to Bovill, Cook-Sather and Felten (2011: 5):

> In one Bryn Mawr student's words: 'You really don't understand the way you learn and how others learn until you can step back from it and are not in the class with the main aim to learn the material of the class but more to understand what is going on in the class and what is going through people's minds as they relate with that material.

According to Hattie's findings (2008, as quoted in Bovill, Cook-Sather & Felten, 2011: 5), Bovill, Cook-Sather and Felten, assert "how 'visible teaching' and 'visible learning' improve student learning outcomes" (2011: 5-6). As an academic staff member claimed: "...students...demonstrated high levels of self-directed learning and autonomy...improved levels of confidence and motivation with a resultant impact on improved student performance" (Bovill, 2009: 41-42, as quoted in Bovill, Cook-Sather & Felten, 2011: 6).

2) the improvement of engagement, motivation and enthusiasm of students and academic staff. Bovill, Cook-Sather, and Felten (2011: 6) added several statements:

- a Bryn Mawr colleague who wrote: "I reconnected with [my students and] repositioned myself as their advocate".
- One of the teachers at University College Dublin stated "... [this work has] really transformed how I think about teaching and how I teach. And the buzz I get from teaching in a way that's interactive...it's really changed how I work" (Bovill, 2009: 25).
- When academic staff feel re-energized and engage more deeply in their work; by extending more opportunities to students to actively engage, learning processes and outcomes are enhanced (Kuh, 2008).

3) The relationship between students and academic staff changes. Bovill, Cook-Sather and Felten (2011: 6) observe that students regularly state that:

> Participating in this program has dramatically helped me to become more patient and take more responsibility for my education. I am finding myself being more understanding of my professor's struggles, and thinking more carefully about what I can do to improve my own experience in the classroom.

However, when discussing the academic staff, these scholars add that "[a]cademic staff similarly comment on the change in relationship: 'I work with students more as colleagues, more as people engaged in similar struggles to learn and grow' (Bovill, Cook-Sather & Felten, 2011: 6).

Davis and Sumara (2002, as quoted in Bovill, Cook-Sather & Felten 2011: 6) state: "We're all learning through engagement with the subject and each other. These articulations of shared commitment and collaborative efforts attest to the power of positioning students as co-creators of learning".

Despite the inconveniencies mentioned at the beginning of this section (3.2), all these added values make the student's role in educational planning deserving of reconsideration. There is evidence that an effective interactive teaching and learning is performed: 1) a deeper learning for both students and academic staff, 2) an improvement in engagement, motivation and enthusiasm of students and academic staff, and 3) a strengthening of the relationship between students and academic staff.

3.3 Active student participation (ASP)

The term 'active' refers to "students engaging with learning, such as, through discussion or critical questioning (Entwistle 1988; Marton & Saljo, 1997). "It challenges the idea that students are passive, and that they only absorb knowledge transmitted by their teacher" (Bovill & Bulley, 2011:1).

Previous research such as that by Rodrigues, Fonseca and Preguiça (2018:17) has shown the benefits that follow when a student is seen as an active learner, working, in this situation, through collaborative learning. These benefits include: (1) deeper learning, the improvement of engagement, (2) motivation and critical thinking, and (3) further problem solving and development of collaborative skills.

In my research, I understand ASP in two different ways: (1) an active participation of students in the pedagogical planning process, and (2) an active participation of students during the development of MOOCs.

Initially the first MOOCs, the so-called cMOOCs emerged in a bid to include students as active participants, even making them partners in the development of curricula. In this regard, few practical cases were found, where students took part in the pedagogical planning process. Owing to the novelty of MOOC area, there is a lack of good practices in this area, and in addition, the current evolution of MOOCs has resulted in what are known as xMOOCs.

Thus, in the literature, I found evidence of cMOOCs as the subject of studies of the active participation of students in the pedagogical planning process. However, today MOOCs are mostly xMOOCs, which do not reflect this in their courses. Instead, xMOOCs use strategies to foster ASP through activities that encourage collaborative learning with discussion forums or peer-reviewing. This is the second research line on which this study is focused: active participation by students during the development of a MOOC. In other words, when students engage actively in the proposed activities.

3.3.1 ASP in the pedagogical planning process

In Bovill, Morss and Bulley's (2009: 1) framework, the authors pose the following question: Should students participate actively in curriculum design in their first year and at other levels? In a higher education environment, students are encouraged to participate as active co-creators, during the learning process (SFC, 2008; SFC, 2006) in good practices, presented previously in section (3.2.1). 'Three types of student participation in pedagogical planning'.

In these three practices, academic staff took an active role when considering students' opinions about participating in curriculum design (Bovill et al., 2008, as quoted in Bovill, Morss & Bulley, 2009) and were shown the different levels and forms of participation. For example:

1) At Queen Margaret University, Edinburgh: students contributed by writing curriculum contents.
2) At University College, Dublin: a VLE was designed by students who had completed the training. They were paid for carrying out this task.
3) At Elon University, North Carolina: several courses were designed by paid students in collaboration with the academic staff.

Findings from these practices were reported previously in section (3.2.2). 'Synthesis of students as co-creators'. All these findings lead us to intuit that greater student engagement in curriculum design has direct effects on the learning process. On the other hand, and emphasising the drawbacks mentioned previously in section (3.2). 'Students as co-creators', despite students expressing the desire to engage in curriculum design, staff questioned whether first year students were experienced enough or properly prepared to design the curriculum. This concern affects not only first-year students, but also staff who have many years of experience in curriculum design but who might think that students are not experienced enough to make decisions about curriculum design. Furthermore, students might also feel overloaded with such work (Bovill et al., 2008; Martyn, 2000; Slembrouck, 2000; Shor, 1992, as quoted in Bovill, Morss & Bulley, 2009: 5). In order to counter these assertions, staff offer preparation, training and guidance to solve the lack of knowledge, and students become more familiar with the elements of academic life.

3.3.1.1 Involving students in educational planning of MOOCs

The fact that students participate in educational planning is more complex than it seems initially. Some aspects need to be taken into account. On the one hand, different cultural viewpoints should be considered when co-creating teaching methods, course design and curricula. On the other hand, pedagogical approaches must also be carefully chosen (Cook, Bovill, & Felten, 2014; Cox, 2009, as quoted in Checkoway, 2018: 78).

Involving students in the design of educational planning can enhance their sense of responsibility and engagement during the learning process. Therefore, this fact implies a need to redesign curricula every academic year with each new cohort of students. In this way, we ensure that all students assume the same level of responsibility each time (Bovill, Cook-Sather & Felten, 2011: 9). Various authors cited in Zhu, Bonk and Sari's (2018: 207) paper argue that this approach encourages participation and reflection by participants. However, these considerations do not always have to be beneficial and suitable.

Thus, with reference to the benefits that the ASP can provide, the following aspects become apparent:

1) Within the higher education framework, active and participative approaches are aimed at improving and encouraging learning (Brown et al., 1989, as quoted in Bovill & Bulley, 2011: 2).

2) the deep commitment by faculty to their learning (McKinney et al., 2010: 89).

3) a deeper comprehension of contents in their specific field of study, and having more confidence to express reflections about academic settings (Delpish et al., 2010).

4) and other improvements such as "group cohesion, collective responsibility, and student performance in assessments, as well as staff reports of transformed teaching practices" (Bovill et al., 2011).

Thus, all these benefits encourage reflection on the need to further explore ASP in curriculum design in the higher education context.

With reference to the MOOC learning model in addition to its educational use of the web, social networks and media, it also has the feature of being constantly emerging and open. Therefore, the MOOC learning model may conflict with the rigid social structure of formal education. The traditional education system implies being prescriptive, having objectives and standardised curricula, schedules, and an organisation based on lessons and exams. In the case of a formal online course, an effective balance between flexibility and limitations is required. MOOCs create new opportunities for co-creation in the field of online networks. Thus, an analysis of the impact and feasibility of this type of participation in the educational planning of MOOCs would be required. The acceptance of MOOCs in formal education remains a challenge.

3.3.1.2 Contextualising the levels of ASP in curriculum design

As we know, the "curriculum is traditionally viewed as the territory of academic staff and curriculum planners, rather than that of the student" (Giroux, 1981, as quoted in Bovill & Bulley, 2011: 2). As we have seen, over the years, the curriculum is traditionally closed and connected only to academic staff. Authors have tried to change this view and have sought other more beneficial ways both for students and teachers to design curricula.

> Fraser and Bosanquet explored ways in which academic staff define 'curriculum' and outlined four definitions, 'a: the structure and content of a unit (subject); b: the structure and content of a program of study; c: the students' experience of learning; d: a dynamic and interactive process of teaching and learning' (Fraser & Bosanquet, 2006: 272). The first and second of these definitions focus on commonly understood study 'units' and they distinguish between module and program/degree curricula. The third and fourth definitions start to capture some of the essence of ASP in curriculum design. (Bovill & Bulley, 2011: 2)

Academic staff and students have different ways of defining curriculum (Fraser & Bosanquet, 2006, as quoted in Bovill, Morss & Bulley, 2009: 5). Before starting the curriculum design process, a negotiation between the two groups is required. This process requires time, energy and skills.

> Time is absolutely essential in the empowerment process. We have found that it often takes time for students to develop the confidence – and the language – to express pedagogical ideas clearly. Many seem at first to doubt that we will take them seriously. In most course design projects, a moment comes when students suddenly realise that they are being heard. We have begun to structure our course design projects to include an early and public point...when students are making an important decision, such as selecting the textbook. This moment typically changes the dynamic of the design group, empowering students to be active participants and showing faculty the value of listening to students. (Felten, quoted in Bovill, Morss & Bulley, 2009: 5)

In addition, in curriculum co-design, the student-tutor relationship poses a challenge. ASP involves a relationship in which teacher and students are learners in the learning co-creation experience through dialogue.

Freire claims that a new concept emerges from this dialogue between the teacher and students: teacher-student and student-teachers. The teacher is not the only one who teaches, but he himself is also learning in the dialogue with students. At the same time those who are taught also teach (2003: 63).

Bovill, Morss and Bulley (2009: 6) mention the following authors with regard to student-tutor relationship. Rogers and Freiberg (1969) assert that the teacher becomes a co-learner in this process. This collaborative view about the student-tutor relationship is based on collective research and the dialogue (Haggis, 2006). However, it is important to highlight the point that the student's active participation does not remove the teacher's experience. The teacher's key role is to facilitate learning (Bartholome, 2003).

In this model of a co-created curriculum, the power or capacity is shared by staff and students. During the process of co-creation, this approach requires staff to be more self-conscious, more adaptable and more effective in meeting students' learning needs. Other limitations for students in their involvement in the co-design process would be regular professional requirements, regulatory frameworks of institutions and personal opinions about how the theme should be taught. This might also limit the level of student participation in curriculum design.

Furthermore, for many teachers it might be uncomfortable to renounce their control of the definition of different curricular elements. Many authors acknowledge that the change in power relations tends to be unpopular among powerful individuals as it implies an abandonment of certain privileges (Gwatkin, 2000). In higher education, student-centred approaches and the students' control of the design of the curriculum will face some resistance from academics. Some examples of these approaches are those that apply to status, power or money.

With reference to curriculum objectives and the impact on learning, the process of curriculum co-creation offers different opportunities for tutors and students. The experience of having participated in curricular design leads students to increase their awareness in the learning process, and the various impacts that this new curriculum might have, such as schedules, the definition of learning outcomes, the establishment of assessments, and the selection of textbooks. Through this process of participation, students gain more control over their own learning.

Bovill and Bulley (2011: 7) attempt to outline how to contextualise the different levels of student participation in curriculum design.

3.3.1.3 Levels of ASP in curriculum design

As Bovill and Bulley (2011) outline, there are few examples of ASP in curriculum design. They are situated “within language education” (Bloor & Bloor, 1988; Breen & Littlejohn, 2000a; Clarke, 1991, as cited in Bovill & Bulley 2011: 3), “e-learning” (Collis & Moonen, 2005, as cited in Bovill & Bulley 2011: 3), “teacher education” (Bovill, Cook-Sather & Felten, 2011; Cook-Sather, 2010a; Delpish et al., 2010; Mihans et al., 2008, as cited in Bovill & Bulley, 2011:3) and “academic development”, (Brew & Barrie, 1999, as cited in Bovill & Bulley 2011: 3).

Bovill and Bulley (2011) present the different levels of ASP. The intention is to invite reflection and discussion in a bid to identify the extent to which ASP is beneficial to curriculum design.

The model outlined by Arnstein (1969: 216), known as Arnstein’s ladder, is described by Bovill and Bulley (2011) as being more specific regarding ASP in curriculum design than other models, “using ideas and phrases that were informed by literature” (Fraser &

Bosanquet, 2006), "discussions with colleagues, and findings from curriculum-related projects in which we have been involved" (Bovill et al., 2008, all quoted in Bovill & Bulley, 2011: 4).

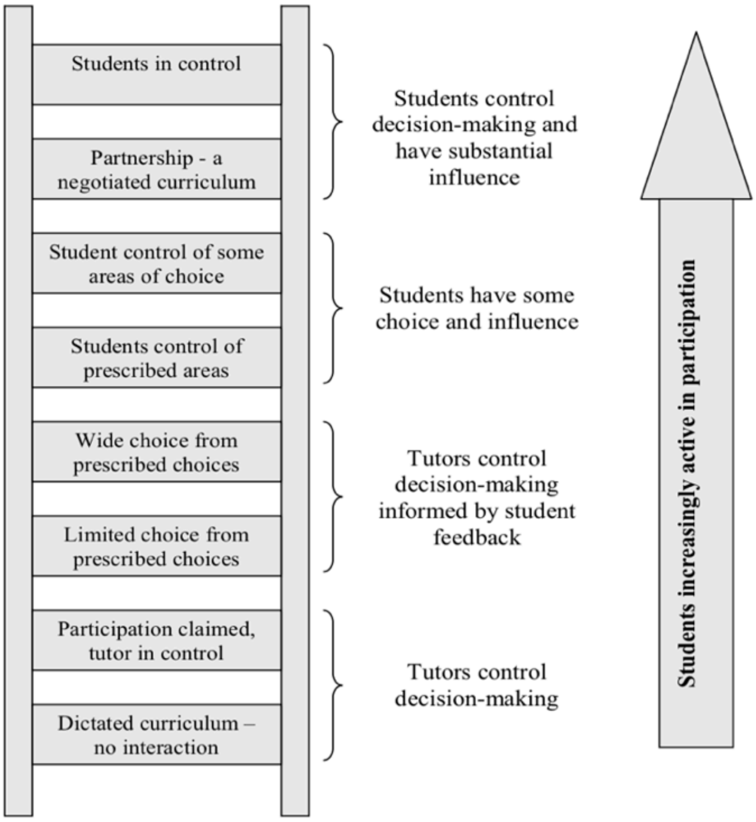


Figure 16. Ladder of student participation in curriculum design (Bovill & Bulley, 2011: 5-6).

As Bovill and Bulley (2011: 5-6) describe eight rungs of a ladder in which the scope of student participation is defined.

1. The tutor has created the curriculum on his own, in other words with no interaction with students. This is 'delivered' to students who have no role in designing or commenting on the curriculum.

2. The tutor calls for an engagement by students, but the tutor is in control. This level is particularly concerning. Students are led to think that they are taken seriously in the process. This could damage the process of students' participation and foster disbelief among students.

3. Here the tutor considers that there are specific areas of the curriculum in which students can engage, such as selection of days and times for classes, or teaching topics from an assortment of choices.

4. This is about an upper level of freedom for students. Broader options within stipulated choices are described by tutors, such as the selection of the topic for a research project, the length of a unit or programme, or the assessment model with some limitations.

5. 'Student control of prescribed areas' indicates that specific areas of the curriculum are designed and controlled by students, such as the VLE for a module (Bovill et al., 2011), or designing, conducting and analysing the module's evaluation (Bovill et al., 2010).

6. Students can select the parts of the curriculum that they would like to design. This is described as a higher level of control than the tutor in the areas chosen for the students. For example, students may choose a project they will carry out according to specific learning outcomes.

7. This is a level of collaboration at which there is an agreement between the parties, students and academic staff. Both works collaboratively to reach agreement on creating the curriculum. Bovill and Bulley (2011:6) highlight Fraser and Bosanquet's (2006: 272) definition of the curriculum as "...a dynamic, emergent and collaborative process of learning for both student and teacher". At this point we can talk about "teacher and student acting as co-constructors of knowledge" (Fraser & Bosanquet 2006: 275).

8. Here the tutor is not present, despite tutors usually keeping at least some control in higher education contexts. However, we might find this model in some vocational courses such a work-based audit project in which students have the freedom to define learning outcomes, project planning, implementation and assessment, for example. It may also be easier to achieve ASP at module rather than programme level. […]. As Bovill and Bulley (2011: 6) note about Tsui (2009), this highest level of ASP does not seem to be in line with effective teaching and learning, as the tutor's role is completely removed. In most cases, the tutor would develop his/her functions as usual, in the role of guide and facilitator (Breen & Littlejohn, 2000b, as cited in Bovill & Bulley, 2011: 6).

These different levels of student participation, of course, are not appropriate in all situations. For example, we cannot compare a large undergraduate group, in which students have been given any preparation or guidance (Shor, 1992) or do not have enough expertise with a small master's level group.

Bovill and Bulley (2011) explain that this ladder is aimed at demonstrating to what extent the student participation is beneficial. In the author's words, this opens a line of discussion of the different levels of possibility and desirability of ASP in curriculum design. In addition, this might suggest that different ASP initiatives could emerge as a method of learning for students in higher education. ASP in curriculum design is one way to achieve deeper learning.

3.3.1.4 Synthesis of ASP in the pedagogical planning process

Student participation in curriculum design enhances and supports the learning process (Kahn & O'Rourke, 2005; Reynolds et al., 2004; Ivanic, 2000; Brown et al., 1989; Kolb, 1984, as cited in Bovill, Morss & Bulley, 2009: 4). Particularly in the higher education context, some authors argue that students' active participation changes their lives. In this regard, for instance, through "the promotion of active and responsible citizenship" students become active citizens who change their communities (Crowther et al., 2005; Scandrett et al., 2005; Wilkinson and Scandrett, 2003, as cited in Bovill, Morss & Bulley, 2009: 4).

However, there are opponents of active student participation. Reynolds et al. (2004, as quoted in Bovill, Morss & Bulley, 2009: 4) warn that "we do not know enough about what is meant by participation". They suggest that there is an extensive use of the term 'participation', because it is sometimes mistakenly used in a positive sense. Different justifications for the existence of potential inconveniences in ASP in the development of the curriculum design are also found in the literature.

When one talks about research in higher education, one generates a debate about whether the current way of teaching and learning is the most suitable. This new concept in education raises questions about the main aim of higher education, considering, of course, the main mission of the university (research and teaching). The main goal is to transfer this new way of working and thinking critically to students so that they include it in their social life. Learning outcomes are based on recognition of the importance of originality and creativity in students' work. In other words, it is more relevant that students learn more about research processes than that they experience a simple transfer of knowledge, with the goal of being prepared to face a labour market that is characterised by constantly evolving technology.

As noted above in the previous good practices, research programmes linked to the attainment of a university degree have a positive influence, in that participation in such programmes increases students' aspirations to achieve further qualifications or a higher degree. Research programmes also promote postgraduate studies.

Therefore, upon completing their studies and these additional tasks, students should be rewarded for their work of academic quality, its contents and added value. This fact would improve the reputation of the institution, which has two prime objectives: research and teaching/learning. Its mission is the awakening of critical thinking and research vision in its students.

Therefore, with reference to students' active participation (ASP) in the curriculum design within the current framework of higher education, we can say that many changes are still necessary when we consider the sharing of authority and power in the relationship between tutor and students. A university that encourages students to act in a critical and a reflexive way is essential if students are to challenge and call into question the world in which they live (Haggis, 2006). However, many authors have expressed their concern about the fact that current universities are losing their critical nature in the field of higher education in the United Kingdom (Barnett & Coate, 2005; Taylor et al., 2002).

Therefore, if students' current objectives in higher education include a significant improvement in their academic success through their involvement in learning, and if students want to be challenged by the learning experience, then it is a fact that ASP requires more research. Subsequently, instructors must be careful when they are designing a MOOC because some aspects are questionable. Do they have to include this factor in the ID process? Reflection is required. I tried to identify this practice in the reviewed MOOCs.

3.3.2 ASP throughout the development of MOOCs

As mentioned above in section 2.2.1.3. 'Challenges facing MOOCs', the most significant challenge facing MOOCs is maintaining high student participation rates and, implicitly, improving completion rates. This is a very difficult challenge, because as explained (see section 2.2.1.3.), there are several reasons for which a student decides to enrol in a MOOC. In the second research strand in which this research is framed, students who participate in the proposed activities of MOOCs are referred to as active learners. These activities include reading, writing, discussions, collaborative learning, problem-based learning, actions that encourage analysis, synthesis, and evaluation.

In order to ensure that students remain in MOOCs, institutions/universities have to find the best ways to make these courses appealing and, of course, to find other strategies, fostered by institutions, that will control and improve student participation figures.

One of the strategies that institutions can control to improve these figures is improving online course environments, making MOOCs more interactive and more communicative. This is the method that is focused on in this study; identifying the characteristics or factors of MOOCs that appeal most to students. Institutions of higher education maintain control through good strategic planning of courses; in other words, methodical and organised ID. Outlining a systematic approach to a MOOC is essential to ensure high student participation rates.

There are several factors that should be present to maintain active student engagement. These include a detailed introduction accompanied by a video, a welcome lecture, multimedia, discussion boards or chat rooms, discussion threads that are linked to related course sections, the presence of instructors to guide, monitor, and mediate discussions, facilitators to provide continuous feedback, social networking sites, web-based communication programmes, computer-graded questions, peer assessment, quizzes, study guides and assignments, live video broadcasts, certificate or badges for completion, and so on.

Active student participation throughout the course of a MOOC is directly related to the presence of appropriate factors that encourage students to participate actively. The following graph illustrates factors that are considered significant when we talk about student engagement.

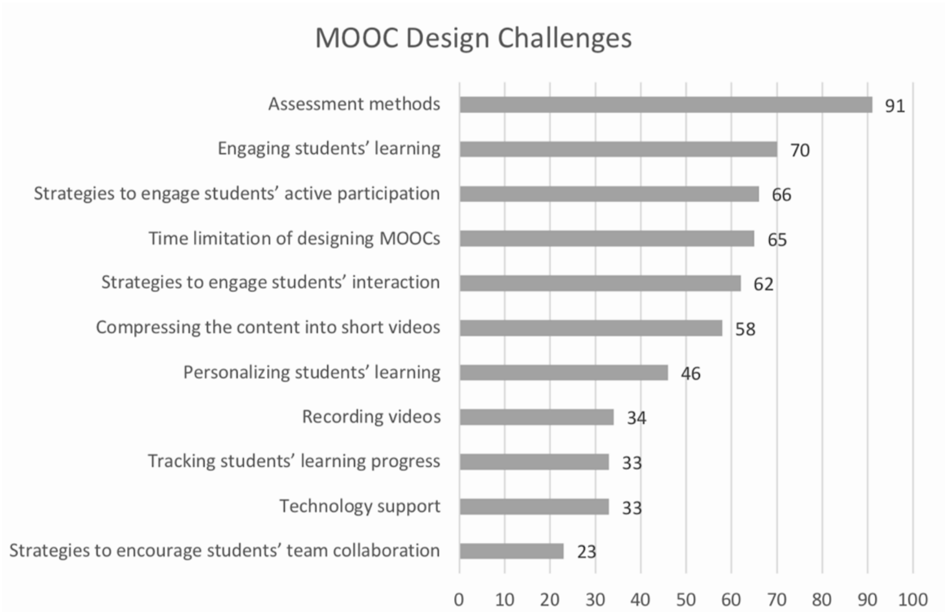


Figure 17. Design challenges faced by MOOC instructors (Zhu, Bonk & Sari, 2018: 219).

The graph shows relevant factors that were included in a survey performed by Zhu, Bonk, and Sari (2018: 219) in a bid to maintain active student participation. This makes clear the importance of developing a very accurate and systematic ID process in which the most suitable factors are considered to ensure active student participation, and thus, effective student teaching and learning.

3.3.2.1 How students learn

In section 3.3.2. ‘ASP throughout the development of MOOCs’, where active learners were discussed, I mentioned that students are considered active when they engage in a course by reading, writing, carrying out a discussion, engaging in collaborative learning and problem-based learning. These are actions that foster analysis, synthesis, and evaluation.

Students experience various benefits from active participation in courses, such as developing a deeper knowledge of the course topics. They enjoy the learning process and at the same time they improve their reflection skills through activities such as teamwork, project work, interactive online activities and peer assessment.

Adapted from Barnes (1989), Active Learning and retrieved from the University of South Australia (2019), the relevant aspects of active learning are:

1) The task has a purpose and relevance to the students.
2) The students can reflect on the meaning of what they have learnt.
3) The students can negotiate learning objectives and methods with the academic staff.
4) The students can evaluate how and by what method learning contents are taught in a critical and a constructive way.

5) The complexity of the learning tasks is comparable to professional contexts and real life.

6) The tasks are situation-driven: that is, the need of the situation is taken into consideration in order to establish the learning tasks.

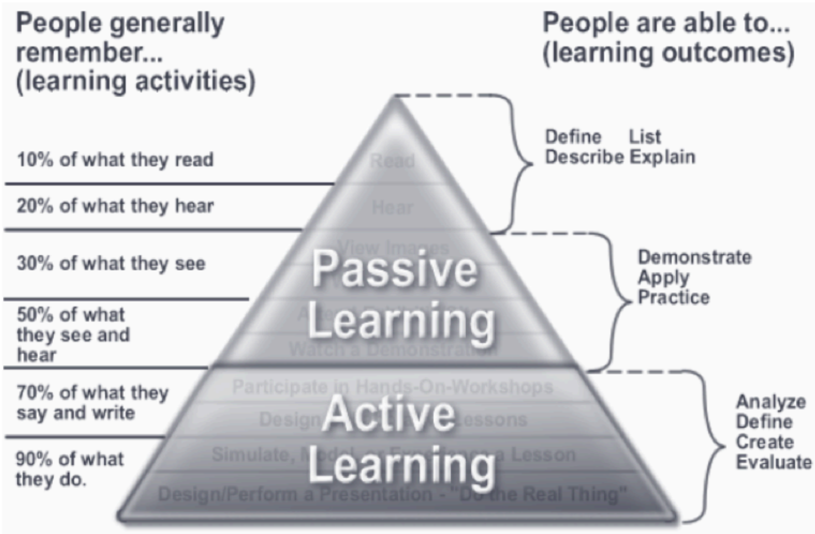


Figure 18. Active learning pyramid. Adapted from Barnes (1989) (University of South Australia, 2019).

Figure 18 depicts the different levels of active student engagement, according to the adapted participation pyramid. It demonstrates how students learn throughout a course. This classification is key to understanding what kind of activities a course should offer in order to ensure effective teaching and learning. This clearly shows that active learning occurs when students engage in activities that they ‘say and write’, and those that ‘they do’. Students have to develop different skills such as analysis, definition, creation and evaluation in order to achieve their learning outcomes.

3.3.2.2 Effective interactive teaching

Effective Interactive Teaching is a technique used by teaching staff to actively involve students during their learning process. Siara Ruth Isaac, pedagogical advisor at the École Polytechnique Fédérale de Lausanne (EPFL), laid out different techniques of effective interactive teaching during a workshop of the same name (Effective Teaching in Higher Education. Teaching Support Centre, EPFL, 2018).

Isaac (2018) reminds us that the involvement of students is key to learning.

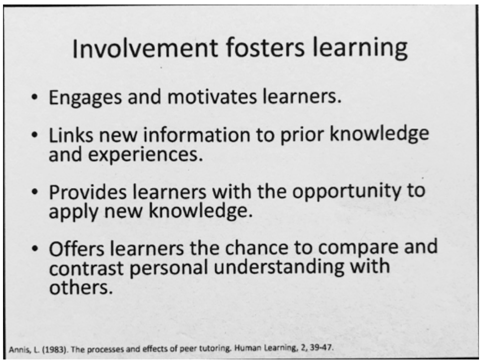


Figure 19. Involvement fosters learning (Isaac, Siara).[18]

Suitable techniques in effective interactive teaching make higher levels of active student participation possible. "[T]he present status of MOOC literature reveals that the available studies have not been reviewed systematically and comprehensively to identify the factors related to effective MOOC teaching" (Wong, 2016: 107), thus, a discussion about what techniques or factors really enhance teaching-learning effectiveness in MOOCs is necessary.

[18] Isaac, Siara R. Teaching Advisor. Teaching Support. Retrieved from https://www.epfl.ch/education/teaching/teaching-support/. Last accessed April 7, 2021.

This research attempted to contribute to this area by systematically observing, classifying and assessing these factors.

Learning techniques used in MOOCs have different nuances when compared to a traditional classroom or 'in-person' teaching/learning. The large number of students enrolled in a MOOC and the fact that students are not in a classroom setting creates the need for a re-evaluation of traditional techniques in order to define what new techniques – or adaptations of old ones – are most suitable for this new setting.

MOOCs, as the name implies, are courses targeted at large numbers of students. Students may be motivated to enrol in a MOOC by a variety of different factors. These could include things such as a personal interest in broadening their horizons, gaining knowledge on a topic they already know something about – or know nothing about – to further educate themselves in the field they already work in – or do not – or to attain a certificate, to name a few. However, from my point of view, this is exactly what makes MOOCs less successful than expected. This is one of the factors that might be prejudicial to effective teaching and learning if it is not managed correctly: "The large scale and heterogeneity of MOOC participants also bring design challenges" (Zhu, Bonk & Sari, 2018: 203). "[T]he pedagogical orientations of MOOC platforms may influence the courses provided, such as the extensive use of videos on Coursera and edX, and active social interaction on FutureLearn and OpenLearning" (Wong, 2016: 106).

Using Wong's paper as framework 'Factors leading to effective teaching of MOOCs' (2016), and the 'Quality reference Framework (QRF) for the Quality of MOOCs, which are discussed later (see next chapter 4), I identified the factors that would be most useful for teaching staff and institutions to promote effective teaching and student learning in online environments. There is hardly any literature on this topic, and that which does exist, does “not cover explicitly the factors leading to effectiveness of MOOCs” (Wong, 2016: 106). However, in my view this was to be expected as MOOCs are still in an early stage of development.

The course structure, from design stage to course delivery, development and assessment, helps one to identify the various aspects that are to be studied and assessed in the MOOC. In this study, my focus was on the design phase, in which all processes, procedures and factors are disaggregated. This detailed breakdown helped me to describe how technology influences the learning process, and therefore, how different educational curricula need to be adapted, taking into account the strengths and weaknesses of the nature of MOOCs. The successful implementation of these factors should assist the teacher in achieving a better delivery of the course and thereby enabling more effective learning by students.

> Previous research that examined traditional online courses has suggested several factors that could influence student engagement. These factors include instructor presence (Das, 2012), instructor humour (Baker & Taylor, 2012), availability of feedback (Sull, 2012), choice of activities (Kelly, 2012), extra course resources (Sull, 2012) and active learning (Harrington & Floyd, 2012). (Hew, 2015: 324)

3.3.2.3 How students learn in an online setting. A brief review of self-directed learning (SDL) and self-regulated learning (SRL)

Online learning students are required to carry out SDL, not only as a study method but also as a set of skills. This subsection does not open a new research line; it seeks rather to clarify a key learning concept related to the student-centred approach, and to adult online learners enrolled in MOOCs. Although this is an implicit issue when considering how learning occurs in MOOC students, I believe that an explanation would help to clarify the sort of student under discussion.

Self-directed learning (SDL) skills are very significant in e-learning. They have grown into a main goal of higher education institutions. For this reason, researchers' interests have been focused on effective learning and instructional strategies in web-based training.

SDL is a concept which emerged in the 1970s from adult education outside traditional schooling. In this type of learning, learners define their own learning tasks. SDL is a wider concept and includes SRL. SRL is derived from educational and cognitive psychology, and is used in the school environment (Alearningjourneyweb, 2017).

Knowles, (1975, cited in alearningjourneyweb, 2017) defines self-directed learning as follows:

> Process in which individuals take the initiative, with or without the help from others, in diagnosing their learning needs, formulating goals, identifying human and material resources, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.

Zimmerman (2017, cited in alearningjourneyweb (2017) argues that SRL means that:

"Students can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviourally active participants in their own learning process".

In self-regulated learning, learners engage in an active process in which they gain independence during the learning process. For instance, they set their learning goals, and regulate their cognition,[19] motivation and behaviour towards achieving their set goals. "Self-regulation is not a mental ability or an academic performance skill; rather it is the self-directive process by which learners transform their mental abilities into academic skills" (Zimmerman, 2002: 65).

Instead, SDL requires discipline by the learners. They take the initiative in identifying their learning goals and have the freedom to create them. In comparison with SRL, they choose the proper strategies to achieve their set goals, and after that, they assess their learning outcomes.[20]

Pintrich (2010, cited in Saks & Leijen, 2014: 192) argues that self-directed and self-regulated learning have similarities with respect to active engagement, goal-directed behaviour, metacognitive skills, and intrinsic motivation.

[19] Cognition: The use of conscious mental processes.

[20] Retrieved from: <https://alearningjourneyweb.wordpress.com/2017/03/13/self-directed-vs-self-regulated-learning/>. Last accessed April 11, 2020.

De Waard and Inge (2016) interpret Loyens, Magda and Rykers (2008), but add that "self-directed learning sees learners as having more control over the learning environment, which provides the learner with the potential of initiating a learning task".

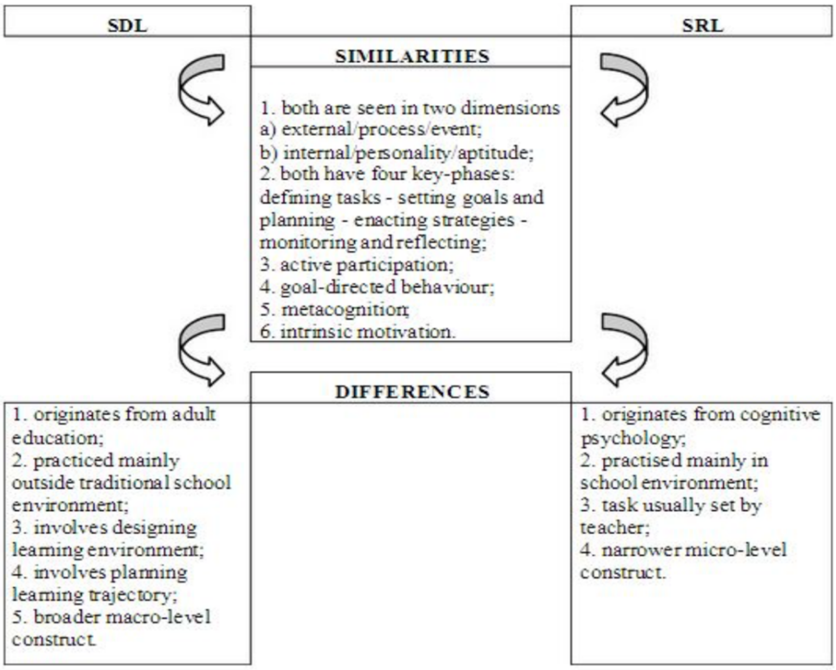


Figure 20. Differences between self-directed and self-regulated learning (Saks & Leijen, 2014: 193).

Considering the differences between the two concepts, and according to the found literature, self-directed learning is more relevant in the current technological and advanced education system than self-regulated learning, because: (1) SDL originates from adult training, (2) this is practiced outside the formal education environment, and in other words is linked to lifelong learning and online education, (3) SDL involves learning designing, and (4) this implies a learning planning route. Thus, self-directed learning was regarded as a concept situated within the scope of this study in the field of educational technology.

In this context, therefore, we could say that learners use self-directed learning as a significant skill when undergoing training. However, and, as previously mentioned at the beginning of this section, self-directed learning was not the focus of this study. Rather, this concept assisted in the identification of: (1) the subject of the study, (2) the kind of learners who were the final users of the kind of training, which I assessed, and (3) how learners learn in an online setting. This concept was not assessed but was considered throughout the project's development.

3.3.2.4 Synthesis of ASP throughout the development of MOOCs

It is difficult to identify why a student decides to drop out of a MOOC, as there many different reasons for enrolling in one; a deeper study of the reasons is possible and required. The reflection is that despite there being intrinsic aspects such as SDL that must be considered when undergoing online training, platforms and universities can take action to enhance the characteristics of their MOOCs, with the goal of improving student participation. How can they achieve this? (1) Analysing the learning outcomes of the course, (2) listening to students and learning more about their preferences from surveys, and (3) trying to keep students active during the course by providing engaging activities. Thus, the whole environment and these engaging activities should make students feel as comfortable as possible. They should be more interactive and more communicative. Therefore, a methodical and organised ID process is key to ensuring the best outcomes of learning.

In this approach, there are many design challenges that platforms and universities should reflect on in a systematic way, studying each factor in the development of the course in more detail.

The adaptation of Barnes pyramid (1989) reveals the sort of activities that engage students required at different levels, and the outcomes of learning. The most effective of these activities are those that require students to analyse, define, create and evaluate. In this approach, effective interactive teaching is the main aim of teaching. Effective interactive teaching is a guarantee of deeper learning.

Chapter 4. Introduction to the pedagogical, technical, strategic and organisational factors involved in creating a MOOC

The identification of best practices is key for the advancement of learning research; in other words, it is essential to share best practices that enhance teaching and learning in online environments. Keeping this line of thought in mind, and with the support of found literature and studies with which I attempted to design a suitable quality framework for all MOOCs, the aim of this study was to provide an outline that would ensure the quality of MOOCs.

I assumed that the quality of a MOOC was equated to the enhancement of teaching and learning in a MOOC, and very importantly, to an increase in student participation rates.

Within this definition of the quality of a MOOC, various aspects are involved, according to the Quality Reference Framework (QRF). These include (1) the identification of key quality criteria for better orientation when designing MOOCs, (2) the definition of all aspects to consider "for the quality development and evaluation of MOOCs", (3) the identification and implementation of good practices, and thus, (4) a continuous improvement "for MOOC design and provision" (Stracke, Tan, Texeira, Pinto, Vassiliadis, Kameas, Sgouropoulou & Vidal, 2018: 5). In this study, I focused on student participation as this is the final goal of education. Enhancing this data poses a challenge for MOOCs. MOOCs enable students, from the lowest level of active participation, in which they engage in the proposed activities, to the highest level, in which they can participate in the development of the MOOC curriculum with the teacher/instructor. When we refer to student participation, we refer not only to students who participate in the proposed activities and who work in teams solving problems, in collaborative training, and so on, in the framework of the active learning pyramid (see section

3.3.2.1), but also to active student participation in curriculum design. This is described in Arnstein's ladder (see section 3.3.1.3.). All levels of participation were considered when analysing the observed MOOCs.

The number of xMOOCs "which follow a cognitivist-behaviourist approach, and rely primarily on video, discussion forums, multiple-choice quizzes or other types of assignments, have currently been growing in numbers" (Hew, 2015: 327). This is the mode of MOOCs I derived from my sources. The identification of what makes a MOOC interesting was, using student participation numbers as a benchmark to measure this, understanding how to better design MOOCs for students.

During the analysis and design stages of MOOCs, different pedagogical orientations must be considered in order to define the one that will be most effective in teaching and reaching the students (so that they internalise and learn the received information). However, Wong (2016: 108) explains that "[n]ot all existing pedagogies are suitable for direct adoption as they were developed before the emergence of MOOCs". Moreover, he adds that "Richter and Krishnamurthi […] recommend that universities and academics explore new and emerging learning theories related to MOOCs as past theories might be unsuitable for the MOOC context" (Wong, 2016: 108). "Advances in technology also enable new education theories or approaches to be experimented with in the MOOC context" (Wong, 2016: 114).

Zhu, Bonk and Sari (2018: 203) discuss pedagogical considerations and challenges that should be considered. They add factors such as "learning objectives, assessment methods, course length, course content, flexibility, and collaborative learning support". Furthermore, "engaging learners, increasing learner interaction, and limited assessment methods" are also important (Zhu, Bonk & Sari, 2018: 203). In addition, we must consider resource factors, which include both technology and human resources, and logistic factors. All these factors are developed further throughout the study, particularly, in section 1.4.1.4.1. 'Phases and processes implicated in the design of MOOCs'.

Zhu, Bonk and Sari (2018: 215) indicate in their research the points that in their survey instructors took into account during their process of ID when launching a MOOC. In the disaggregated graph in the following figure it is clear that not all factors of these MOOCs were undertaken, and not all instructors were accurate in a systematic ID. A systematic and a comprehensive MOOC design process (ID) is essential to ensure high student participation and effective learning. This should be the methodology of any creation process of a MOOC if one hopes to achieve these objectives (2018: 208).

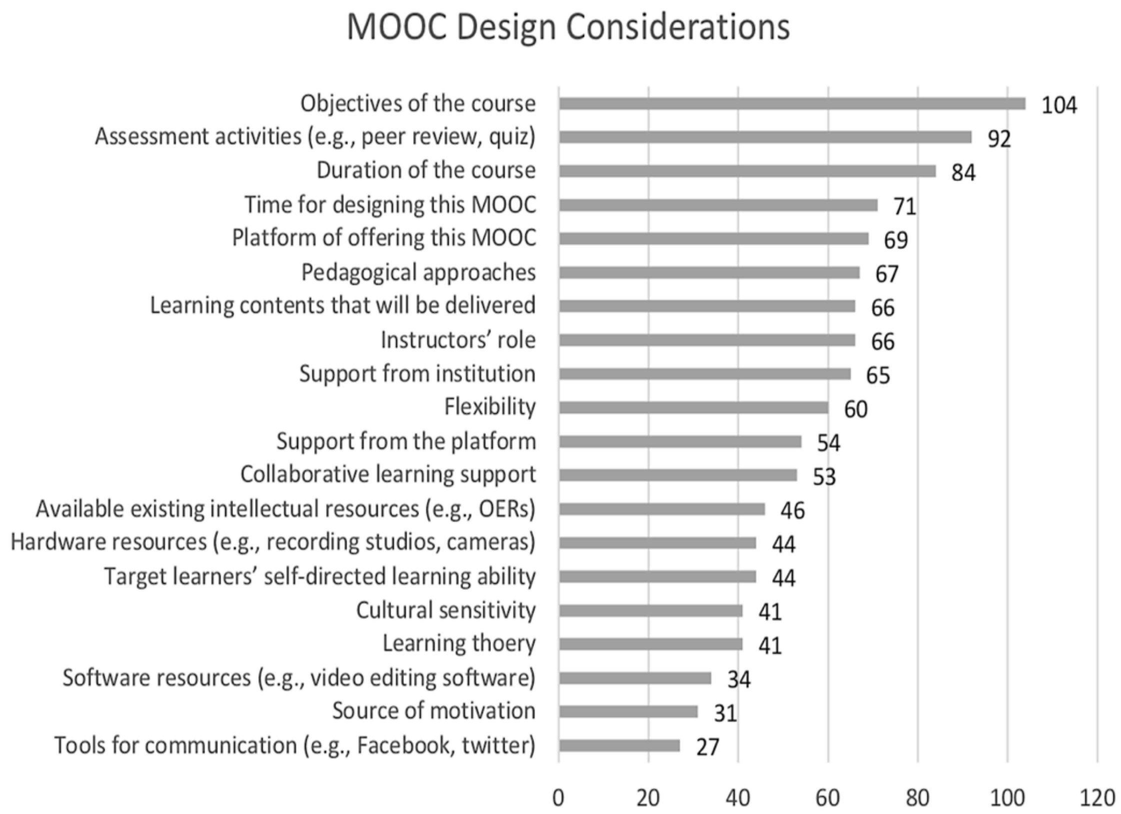


Figure 21. MOOC design considerations (Zhu, Bonk & Sari, 2018: 215).

The graph indicates that 75% of MOOC instructors took into account the learning objectives, and 66% considered assessment. Under half of the respondents in the study considered the time invested in the MOOC design, 48% of instructors reflected on their pedagogical approaches, and 47% revised the course materials that were to be delivered (Zhu, Bonk & Sari, 2018: 214).

Thus, this graph suggests that instructors do not always consider all the factors required to ensure high student participation in a MOOC.

Furthermore, Zhu, Bonk and Sari (2018: 217) showed in their study investigating the meeting of students' needs that 74% of instructors conducted discussion forums in their

MOOCs, 67% included supplementary course content, and half of the respondents posted notices on time and sent emails, as can be seen in the following figure.

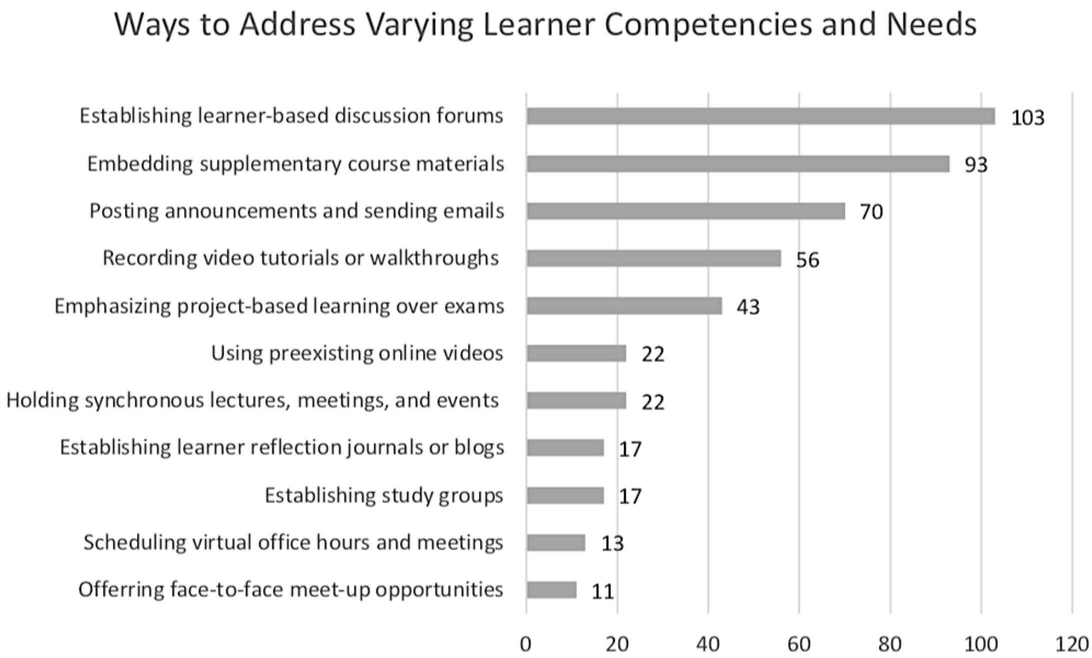


Figure 22. Ways to address varying learner competencies and needs (Zhu, Bonk & Sari, 2018: 217).

> The instructors also provided different kinds of learning resources. […] 90% provided discussion forums or threads, 78% of instructors embedded video lectures and tutorials in the MOOC, 74% of instructors included readings, 55% of instructors offered practice quizzes and exams, and 54% of them relied on expert interviews. Other resources that these respondents used in their courses included interactive assessments (45%), PowerPoint and other presentation slides (41%), instructor lecture notes (40%), visuals (e.g. concept maps, diagrams, etc. (36%), and animations and other types of animated or interactive contents (34%). (Zhu, Bonk & Sari, 2018: 217)

The European Commission selected the Quality Reference Framework (QRF) as the most innovative Erasmus project for the European Conference in Poland. This document helped me to set up the factors and considerations which would define quality standards.

4.1 What engages MOOC students in learning?

Maintaining the interest, attention, participation and interaction of students is the most difficult challenge that MOOCs have to overcome. Students tend to lose interest in courses after a relatively short time, which makes fidelity the most challenging part of course delivery. This is the most difficult stage for institutions and teaching staff, and different basic aspects must be considered. They are developed in more detail below:

a) Easy accessibility to the MOOC, anywhere, anytime and from any device (laptop, tablet, cellular device).
b) Teaching staff must organise/structure the material of the course. A quick overview of the topics which will be developed during the course should be presented at the beginning of the course.
c) At any point in time, students must be able to see clearly where they are in respect to the entire course. MOOCs are characterised by learners being able to follow the course anywhere, at any time and at any pace. If this is to work, MOOCs must provide an easily understandable overview of the course.
d) The presence of teaching staff is essential in order to achieve and maintain a high level of participation and completion rate among students. Instructor accessibility is key to promoting the engagement of students: "In the MOOC environment,

> interaction with instructors is usually minimal, […] [r]eflecting on their MOOC teaching experience" (Wong, 2016: 109). "Ross et al. (2014) stated that students were very much concerned about the presence of their instructors from the beginning of a course" (Wong, 2016: 109). "Continuous feedback is thus important to encourage participation in the learning community" (Wong, 2016: 111).

Zhu, Bonk and Sari (2018: 216) explain that engaging learners was the primary factor to consider in their instructional design process of a MOOC. Sixty-eight percent of respondents delivered a certificate, 59% of instructors used self-paced learning, 57% offered optional readings, interactive videos, or other materials, and 41% encouraged learners to develop projects. One instructor from the UK who took part on the Zhu, Bonk and Sari study mentioned the following:

> When we were designing, we tried to have a hook for each week, a reason for learners to come back each week. So, we built that into our learning design. So, what's going to be the big thing that makes you want to join the course in Week One (first week). (Zhu, Bonk & Sari, 2018: 216)

Figure 23. Ways to engage MOOC students in the learning process (Zhu, Bonk & Sari, 2018: 216).

4.2 What makes a high-quality MOOC?

At the beginning of chapter 4, I summarised the included aspects of the definition of quality of a MOOC using the framework for quality standards provided by the QRF. A more detailed description of all these aspects is provided in section 1.4.1.4.1. Reviews.com (2018) published a detailed list of the basic features that make up a high-quality MOOC. These are all the factors that must be considered by the following role players (designers, facilitators and providers) (Stracke et al., 2018: 9).

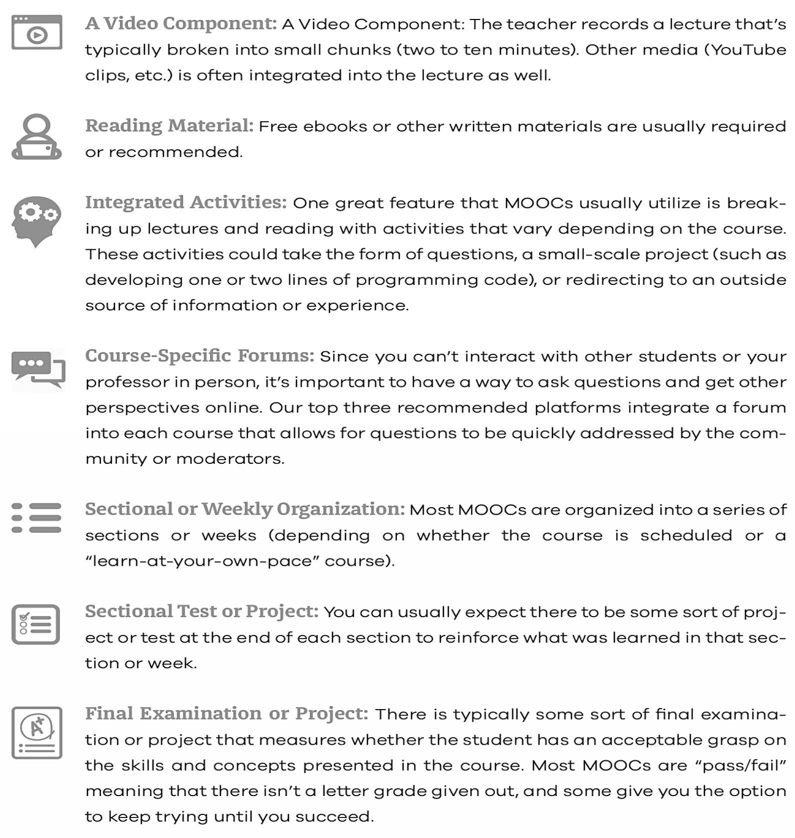


Figure 24. MOOC quality standards considered by designers, facilitators and providers (Reviews, 2018).

The article encompasses all the factors that are explained and developed comprehensively and systematically in the following section. These are the basic factors required to make a MOOC an interesting tool for training of both the inexperienced and the professional learner who is thinking of developing his/her transferable or professional competences or broadening his/her knowledge.

4.3 Instructional design process of a MOOC using an ADDIE model

The QRF guide for the Quality of MOOCs within which this research has been developed, was created following the ADDIE model.

> ADDIE is an instructional systems design (ISD) framework that many Instructional Designers and training developers use to develop courses. The name is an acronym for the five phases it defines for building training and performance support tools: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation.[21]

As Zhu, Bonk and Sari (2018: 206) explain in their paper:

> Analyze relates to the identification of the probable causes for a performance gap. Design refers to the verification of the desired performances and appropriate testing methods. Next, the development phase involves generating and validating the learning resources. Fourth, the implementation phase refers to preparing the learning environment and engaging learners. Fifth, the evaluation phase is used to evaluate the quality of the instructional design, products, and processes.

[21] Wikipedia. Retrieved from: < https://en.wikipedia.org/wiki/ADDIE_Model>. Last accessed March 24, 2020.

Three dimensions are defined in the QRF document:

Dimension 1: Phases	Analysis, Design, Implementation, Realization, Evaluation
Dimension 2: Perspectives	Pedagogical, Technological, and Strategic
Dimension 3: Roles	Designer, Facilitator, and Provider

Figure 25. Three dimensions of the Quality Reference Framework (Stracke et al., 2018: 6).

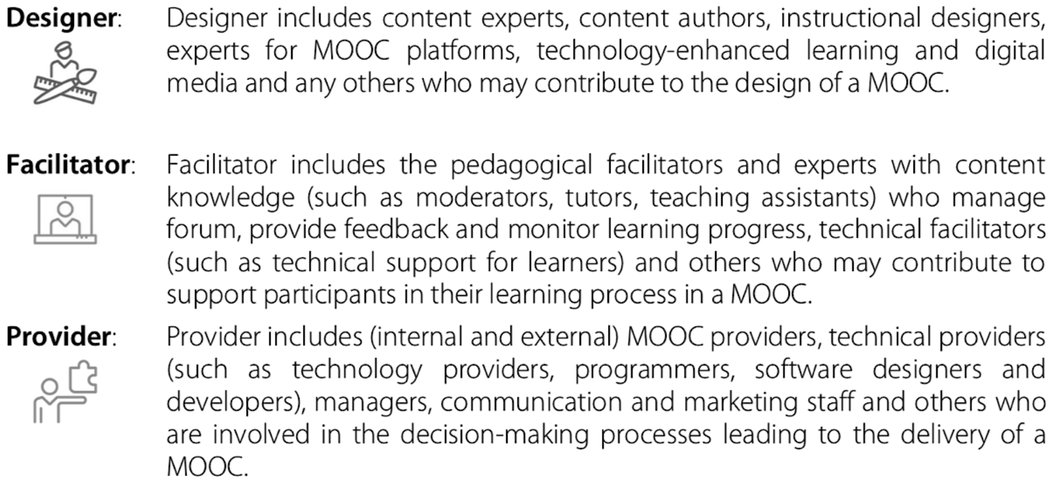
In each phase (dimension 1), up to three perspectives (dimension 2) might be required to carry out each one of the processes and procedures detailed in the guide (pedagogical, technological and strategic). I focused on the design phase (dimension 1). In the section 1.4.1.4.1. one can see how the QRF has included the perspective in each one of the processes included in the design phase. At the beginning of each defined procedure there are initials indicating the following:

(P) pedagogical

(T) technological

(S) strategic

In addition, here are three main roles (dimension 3) implicated in the process of launching a MOOC: designers, facilitators and providers. These role players were embodied in the processes and procedures developed further in section: 1.4.1.4.1. Role players implicated appear at the beginning of each process. I included them only as a mention and did not evaluate them in the study.



Designer: Designer includes content experts, content authors, instructional designers, experts for MOOC platforms, technology-enhanced learning and digital media and any others who may contribute to the design of a MOOC.

Facilitator: Facilitator includes the pedagogical facilitators and experts with content knowledge (such as moderators, tutors, teaching assistants) who manage forum, provide feedback and monitor learning progress, technical facilitators (such as technical support for learners) and others who may contribute to support participants in their learning process in a MOOC.

Provider: Provider includes (internal and external) MOOC providers, technical providers (such as technology providers, programmers, software designers and developers), managers, communication and marketing staff and others who are involved in the decision-making processes leading to the delivery of a MOOC.

Figure 26. The three main roles in MOOCs (Stracke et al., 2018: 8).

These role players are indicated by the following legend: Designer (D), facilitator (F) and provider (P). In cases where one of these three role players was the responsible for the process, the legend R (responsible) is included, and X (involved) describes the role players implicated in each process.

Another interesting perspective in the MOOC launch process is that Zhu, Bonk and Sari (2018: 207) reference authors such as Alario-Hoyos, Pérez-Sanagustín, Cormier, and Kloos (2014), who explain that there are three dimensions of design considerations which should be considered, and thus included in the stages of the ADDIE model.

1) Resource factors, which refer to both technology resources and human resources.
2) Pedagogical factors such as "learning objectives, assessment methods, course length, course content, flexibility, and collaborative learning support, learners' self-directed learning ability, and cultural sensitivity" Zhu, Bonk & Sari (2018: 221). Three subdimensions are also considered:

i. A learning environment perspective: a) participatory learning environments, b) proper support from platforms provided by universities, and c) a shared knowledge community or collaborative community (Zhu, Bonk & Sari, 2018: 207).

ii. A student perspective: a) a cohort-driven pedagogical design, and student expectations and motivations, b) a students' prior knowledge, and c) short videos, lectures, resources, social media, and digital badges (Zhu, Bonk & Sari, 2018: 207).

iii. A theoretical perspective: a) main fundamentals of instructional design, (b) "connectivism learning theory", and (c) self-directed learning (Zhu, Bonk & Sari, 2018: 207).

3) Logistical factors of MOOCs, which include the special conditions of having many diverse students interacting on an online platform, make their design special in the early stages of understanding. Aspects such as the time investment from teaching staff and experts in planning and designing a MOOC, and the constant support of teaching staff must be considered.

All these previous approaches and dimensions mentioned in this section indicate that ID plays a meaningful role in the process of launching a MOOC. Thus, ID should be a systematic and a comprehensive process to ensure a high level of student participation.

4.4 Synthesis of introduction to pedagogical, technical, strategic and organisational factors in creation of a MOOC

In this section I have gone a step further and have provided more detail on the design process of a MOOC. The identification of best practices from publications, and my own analysis of data led me to identify what would be the most suitable quality framework to ensure effective teaching and learning in a MOOC, with the final aim of attaining a high student participation rate.

There are different reasons for students deciding to enrol in a MOOC, from achieving a certificate (the most common reason) or simply just broadening their knowledge. Maintaining the interest, attention, participation and interaction of students is the most difficult challenge that MOOCs must overcome. Thus, the correct definition of factors such as easy accessibility to the MOOC or the constant presence of academic staff are essential to ensure high student participation.

Thus, this section reflects on what a MOOC should comprise to be a high-quality MOOC. Herein, one can find meaningful factors that MOOCs should include such as lecture videos, reading material, integrated activities, discussion forums, weekly organisation, tests, quizzes or projects, and final projects or final examinations.

The QRF for the Quality of MOOCs was the chosen guide within which the practical aspects were developed. Of the proposed guidelines, the focus is on the design phase and on all processes, procedures and factors involved in the design process of launching a MOOC.

From this starting point, all factors included in the various processes and procedures in the design phase were analysed to draw useful conclusions with the aim of enhancing the student participation rate.

In section ‘III. Results’, (see section 1.1. and 1.2.), the design challenges are evaluated. In Zhu, Bonk and Sari’s (2018: 219) study, MOOC design challenges encountered by some instructors when they designed are reflected in figure 27. Factors such as assessments methods, engaging students’ learning, strategies to engage students’ active participation, time limitation, and so on, appear in the graphic as a concern for some instructors. Considering these would make MOOCs more successful and more effective in teaching/learning.

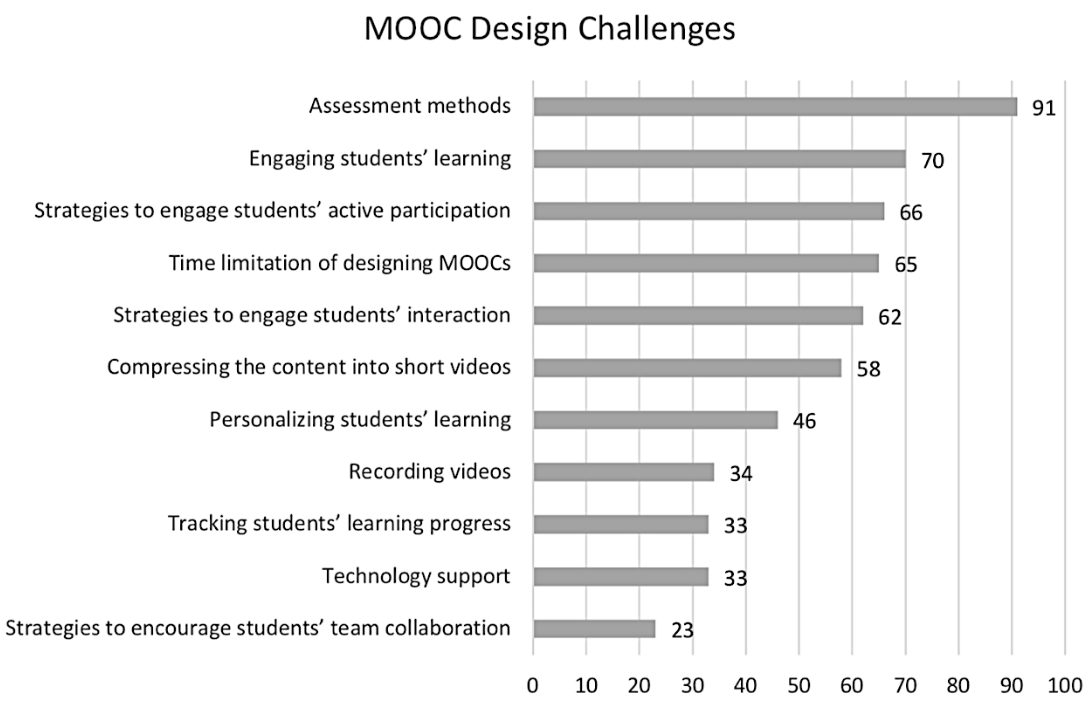


Figure 27. MOOC design challenges faced by the MOOC instructors (Zhu, Bonk & Sari, 2018: 219).

These previously identified factors are included in the design phase of a MOOC. All are required to launch a MOOC. The aim of this study was to analyse which of these have been implemented in current MOOCs, and to establish which work best. Furthermore, institutions have an interest in assessing which is the most appropriate business model to deliver MOOCs.

Summary of section I. Theoretical framework

Bringing this section to a close, I have summarised the main points. This theoretical section covers aspects that relate to the themes of the research and which should be considered when defining the methodological outline for the design of a MOOC. Four chapters were included to frame the research problem. The following topics were developed: online training, massive open online courses (MOOCs), an approach to the MOOC design process, and an introduction to the pedagogical, technical, strategic and organisational factors involved in creating a MOOC. The concept of ID emerged as playing a meaningful role. The goal was to approach the research from what online training purports to be and to determine the role the instructional design process plays in the process of MOOC delivery.

The context of the MOOC provides an appropriate opportunity to assess a student-centred and an active learning approach. Despite MOOCs being an informal learning context because they are still in an early stage of development, the evolution of MOOCs has experienced a sharp growth during the last months, particularly in the currently situation (2020) where people were forced to maintain social distance. The literature referred to throughout the theoretical framework showed the benefits to be had when a student is an active learner: deeper learning, the improvement of engagement, motivation and enthusiasm among students and teaching staff, and the strengthening of the relationship between students and academic staff.

There are two approaches to what active student participation means: (1) active student participation in the pedagogical planning process, and (2) active student participation during the development of MOOCs. In this section, considerations such as the elements that engage students to the MOOCs in learning, what it means to involve students in the pedagogical planning process, what makes a high-quality MOOC, and an introduction to the ID within the QRF (to name a few) were the subject of the study.

Meaningful information on how MOOCs are increasingly becoming in an essential tool were extracted from the literature. Statistics show the importance that online training is acquiring day by day. The need to place more emphasis on online training in order to enhance its methodology, tools, and thus, its outcomes drove this study. These objectives were addressed through field study, and this research is a step further in the mission of placing online training, particularly MOOCs together with on-site training, as one of the two key strands that will comprise higher education in a near future.

SECTION II. METHODOLOGICAL FRAMEWORK

Chapter 1. Design of the research

1.1 Type of study

The purpose of educational research is to improve student learning. In line with this aim, educational research is a scientific and systematic process of collecting information from a starting point of defined objectives (Suray, 2013: 2). This involves using a scientific method that will provide answers to educational issues (SAGE Publications, 2019: 17). Owing to its scientific nature, educational research, "must be approached from the perspective of objectivity" (SAGE Publications, 2019: 8). "The primary goal of nearly all educational research studies is 'to describe, explain, predict, or control [educational] phenomena'" (Gay et al., 2009, as quoted in SAGE Publications, 2019: 9). The design of this educational research leads to a better understanding of educational processes and the enhancement of online education in MOOCs.

In a research process, researchers must contextualise how they are going to explain the reality within which they have framed their research. This implies defining a perspective or paradigm. "Paradigms are defined simply as a basic set of beliefs that guide action" (Guba 1990, as quoted in Young, 2003). "A more developed definition of a paradigm—one of my own creation—proposes that a paradigm is a philosophical framework or structure wherein ideas can be coordinated and arranged to produce an understanding" (Young, 2003).

In the same line, the research approach was framed within a postpositivist (quantitative method) and a constructivist (qualitative method) paradigm; post-positivist because it was intended to provide answers through direct observation and measurement of a sample of

MOOCs, and constructivist because it was intended to provide added value through knowledge building from previous experience and research studies.

Table 2. Research paradigms.

Research paradigms	Post positivism	Constructivism
Ontology: the position on the nature of reality	Objective. Exists independently of human thoughts and beliefs or knowledge of their existence, but is interpreted through social conditioning (critical realism)	Socially constructed, subjective, may change, multiple
Epistemology: the view of what constitutes acceptable knowledge	Only observable phenomena can provide credible data, facts. Focus on explaining within a context or contexts.	Subjective meanings and social phenomena. Focus upon the details of situation, the reality behind these details, subjective meanings and motivating actions.
Research methodology: the model behind the research process	Quantitative or qualitative	Qualitative

Note. Data are from WriteThatPhD (2017).

As mentioned above, this research was framed within a mixed methodology with the goal of using the strengths of both methods (qualitative and quantitative) combining them. “Mixed method research is a research design or methodology in which the researcher collects, analyses and mixes (integrates or connects) both quantitative and qualitative data in a single study or a multiphase program of inquiry" (Creswell et al., 2004, as quoted in Imran & Yusoff, 2015: 389). The goal is to integrate and to discuss them jointly and concurrently. (Hernández Sampieri, 2013: 546).

Within the perspective of mixed methodology, the approaches of this research were descriptive research and document analysis, with the aim of enriching and completing the inquiry with previous experiences and studies. This research was exploratory in nature[22] because the issue focused on was quite a novelty and has not yet been widely explored. For this reason, qualitative methodology became a relevant source of information, considering that there was little research on the topic when this research began. The descriptive method led me to develop an instrument (CAT_{50} index), which identifies and analyses "the how, what, when, and where questions of [] the research problem, rather than the why" (Formplus blog, 2020). The aim of the research was to describe the characteristics of MOOCs using descriptive statistic techniques through observation, comparison and data submission.

[22] "Exploratory research is the process of investigating a problem that has not been studied or thoroughly investigated in the past. Exploratory type of research is usually conducted to have a better understanding of the existing problem, but usually doesn't lead to a conclusive result". Retrieved from <https://www.formpl.us/blog/exploratory-research>. Last accessed October 28, 2020.

1.2 Objectives

The formulation of research questions was a result of a review of the literature. This instrument allowed me to develop the research, and to identify the existing gaps in this specific topic. This provided me with the appropriate information to provide answer to the research questions through a review of the literature from various sources, such as international scientific magazines, media blogs, web portals, and videos. The intention was always to check the latest publications because this is an area of constant evolution, but not to omit the fundamental theory related to the topic. The literature was searched in different ways: (1) recommended readings by tutors, (2) through the use of online databases that were searched using keywords, (3) readings of publications not available online such as books, and (4) through references found in read publications.

The gaps in the research emerging from the analysis of the literature guided me to pose the following questions related to the high number of students who drop out of the new training modality provided by MOOCs. Thus, after a systematic bibliographic review under the framework of MOOCs, the following research questions were posed:

a) What characteristics/features should a MOOC have in order to ensure a high level of student participation?
b) What are the most suitable factors to consider when designing a MOOC with the aim of encouraging participation?
c) Would it be beneficial for the course if students participated in the design of the MOOC?

The objectives that I intended to answer in the research were approached from two angles: (1) an analytical approach with which I attempted to update and deepen the existing knowledge with the intention of providing a snapshot of what was happening within the framework of this research, and (2) an empirical approach linked to the instruments of data collection. Thus, the thesis had a general objective and five specific objectives.

The main aim of this research was to study how the students who were enrolled in a MOOC could be provided with a proper learning environment adapted to their needs, including useful training elements, information and personalised guidance. In other words, to identify what aspects required improvement in order to structure a (design) outline. Thus, the study was intended to discover the meaningful factors that would provide answers to this general objective, through the following specific objectives.

1) To analyse MOOCs in order to define design outlines.
2) To identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation.
3) To collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation.
4) To identify the factors that best encourage student engagement.
5) To analyse the role of student participation in the design of a MOOC curriculum.

Below, the interrelation between the specific objectives and instruments used in the research is captured in the following table. These instruments were used to search for information from two sources: a document and a descriptive analysis.

Table 3. Interrelation between specific objectives and instruments of data collection.

Objectives	Document analysis	Descriptive analysis
Specific objective 1 Analyse MOOCs in order to define design outlines.	X	X
Specific objective 2 Identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation.	X	X
Specific objective 3 Collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation.	X	X
Specific objective 4 Identify the factors that best encourage student engagement.	X	X
Specific objective 5 Analyse the role of student participation in the design of a MOOC curriculum.	X	

Answering these specific objectives would allow me to identify the meaningful factors that should be considered by instructors during the design process of a MOOC. The goal was to ensure that this was about a MOOC of good quality, used to facilitate high student participation rates.

1.3 Methodological justification

Within the framework of research questions and objectives, this research used quantitative and qualitative methodology, also called mixed methodology. The purpose was to gain a more complete understanding in order to respond to the research questions by obtaining different but complementary data on the same topic (Morse, 1991, as quoted in Embraced Wisdom Resource Group, 2015).

This method has pragmatism as its philosophical foundation, where different research lines are independently oriented, and interpreted together at the same time (Hernández Sampieri, 2013: 551). In this way, qualitative data are combined with quantitative data. I chose this method because I needed to collect both types of data, which would have equal value in understanding the research questions.

Gasevic et al. (2014, as quoted in Veletsianos & Shepherdson, 2016: 24) analysed research methods from early literature in the field of MOOCs and showed that 33.3% were quantitative, 24.4% were qualitative, and a mix of the two made up 42.3%. Furthermore, it is important to mention that the kind of data collected does not necessarily reflect the analytic methods. Thus, data can be analysed using different methodologies, both quantitative and qualitative, as required.

When research questions converge in two methods (quantitative and qualitative), one can talk about mixed of methods. This thesis tried to respond to research questions through observation, statistical analysis, and the search for publications. From this point, a comprehensive and a systematic data analysis was performed; the concurrent collection of quantitative and qualitative data, analysis of both independently, comparison of results, and then, the merging of the results during interpretation or during data analysis (Embraced Wisdom Resource, 2015).

This study collected a quantity of meaningful and diverse data. An experienced source and pioneer institution in MOOC initiatives in Europe and a benchmark in this area, provided me with a sample of 80 MOOCs. The collection of data, which was concurrent and consecutive in nature, allowed me to set up and to complete the classification of the different data included in the design phase of MOOCs. Thus, the next step was designing data collection instruments, taking into consideration the following essential aspects framed within the context of MOOCs: types of features, characteristics, pedagogical approach, design, quality, methodology, knowledge area, benefits, competences, and limitations.

After careful consideration of the chosen methodology, I decided that the descriptive research method, in addition to the search for publications, studies and literature, would lead me to the results that I wanted. In other words, I would be able to identify whether there were some features/factors that made some MOOCs more interesting and appealing than others, and thus, encouraged student participation.

1.4 Instruments of data collection

This section includes the instruments that were used to collect data on MOOCs within the framework of this study. Document analysis and descriptive statistical analysis are covered next, developed in the following sections: data collection technique, data collection process, the sample, and data analysis process.

1.4.1 Document analysis

1.4.1.1 Data collection technique

From the outset, this research took on an exploratory nature because MOOCs are still at an early stage and are constantly evolving. All the defined specific objectives were linked to this instrument (document analysis) as this was the main mean which allowed me to complete the descriptive analysis, and thus, this is the main source from which I extracted information from recent studies, findings, and other publications. Document analysis played a fundamental role in this study.

Specific objectives linked to document analysis:

1) To analyse MOOCs in order to define design outlines.
2) To identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation.
3) To collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation.

4) To identify the factors that best encourage student engagement.
5) To analyse the role of student participation in the design of a MOOC curriculum.

Document analysis in qualitative research is a meaningful tool which allows the researcher to interpret extracted information to give it voice, meaning, understanding and to develop empirical knowledge within the framework in which the researcher develops to assess a specific topic (Bowen, 2009: 1). Previous literature and studies have a significant role in this research, being a main part of the study. The work of searching, selecting, finding, and appraising is fundamental to achieving the most suitable perspectives within the study framework (Bowen, 2009: 2).

1.4.1.2 Data collection process

In the comprehensive literature review, the qualitative method was applied by searching for "publication" (e.g. institutional reports, research journals…), other studies, and practical case studies based on MOOC designs.

With reference to publication, my search consisted of using the keywords "best platforms of MOOCs", "MOOCs", "Massive Open Online Courses", "effective MOOC design", "effective teaching and learning MOOC", and so on. The publications were the most recent possible.

This search allowed me to deepen my knowledge of MOOCs, and to constantly update this knowledge. New studies were continually emerging as a result of the interest that MOOCs area is experiencing.

1.4.1.3 The sample

When this research began, the literature review was fairly complicated. It was a challenge to find recent studies and literature related to MOOCs, owing to the lack and inaccessibility of literature reviews. The need for social distancing since last year (2020) has led institutions to expand and to deepen research in this area. Part of their strategy has been to strengthen this action strand, that is MOOCs, which have benefits such as cost-effectiveness and access to a large number of students. Thus, several new and significant studies related to MOOCs have emerged. As a consequence, I was able to develop this study by including a careful review of recent studies and literature.

With relation to the specific objectives of the study, using document analysis I was able to address the research questions. All the specific objectives were developed using this qualitative method.

1.4.1.3.1 Selection criteria for subject of study

The selection criteria for the subject of study were as follows:

I identified the best two platforms that offered MOOCs, making a careful selection. This selection consisted of choosing between platforms that adopted a strategic approach and invested constantly in the development and continuous improvement of their online practices, which resulted in the establishment and configuration of a new virtual education landscape. Institutions, in this case universities, were using platforms on which they offered their own MOOCs.

Various studies analysed the "Best Practices in Online Learning" (Neumann, 2013). All these reached consensus when defining these best practices. The most important aspects of best practices include:

- Systematic development and assessment of the curriculum based on the learning objectives programme.
- Effective interactive teaching/learning in online training.
- The selection of a suitable online pedagogy and learning model.
- The provision of diverse learning activities to enable students to reach their learning outcomes in each course (e.g. interactive learning via discussions and project-based learning).
- A high rate of student engagement and participation, focused on quality and prompt instructor feedback.
- A proactive system for assessment of learning outcomes.

- Learning management systems that operate closely with their users to support the learning model and assessment thoroughly.
- Proactive and supportive online student assistance and retention services.

These criteria, and the information from the literature review indicated that the development of two new concepts was required to find out more about the most interesting and the most appealing platforms for learners which would best meet students' needs. These concepts were essential to understand how the selection criteria were applied: platforms and aggregators.

Platforms, also called providers, are software applications that are learning management systems that execute all the processes involved in the launch process of a MOOC. These processes are administration, documentation, tracking, reporting, and delivery of training programmes.[23]

Figure 28. Some of platforms/providers

[23] Retrieved from: <https://en.wikipedia.org/wiki/Learning_management_system>. Last accessed May 17, 2020.

Providers (platforms) supply information about the openness of courses, such as whether there are prerequisites or not to access the MOOC, and information about their corresponding certification.

The differences between these two sources, platforms and aggregators, are as follows: whereas platforms/providers supply institutions and students with all the aspects related to MOOCs to ensure the correct delivery of these courses, aggregators have the role of providing information about why MOOCs are useful to potential students.

Aggregators are multiplatform registers of MOOCs. They are search engines which users can search for information about MOOCs, based, for example, on keywords, on subjects, or a start date. Their searches are usually developed and focused on reviews and ratings that are useful to students who want to compare several MOOCs. Aggregators also include MOOC reports with trends and news.

In their article “A MOOC Taxonomy Based on Classification Schemes of MOOCs”, Liyanagunawardena et al. (2019) argue that the best aggregators are: (1) Class Central, (2) CourseBuffet, (3) CourseTalk, and (4) MOOC-List. All these allow you to search for online courses, that is MOOCs. In fact, one of them is defined as “the most organised online course catalogue” (Liyanagunawardena et al, 2019:10).

1) Class Central. The current situation, in which the Covid-19 pandemic has forced us to practise social distancing, has caused an exponential growth in online education. Class Central announced on its website that by the end of April 2020, 9 million students had visited Class Central web, compared to 500,000 curious people before the pandemic. Thus,

"Coursera received over 10 million course enrolments in a 30-day period, up 644% from last year. And edX became one of the world's top 1000 websites" (Shah, 2020).


Dhawal Shah
@dhawalhshah

In the last 30 days, Class Central received more traffic than we did in 2019. These users were also more engaged.

One number in particular stands out to me - clicks to the provider (Go To Class button clicks on our course pages). They increased significantly, 4.4m vs 2.5m.

	2019	Mar 15 - Apr 15
Uniques	6.9M	7.4M
Pageviews	21M	30M
Registrations	355k	380k
Clicks to Provider	2.5M	4.4M
Lists Created	21k	160k
Bookmarks	1.3M	1.6M

47 3:22 PM - Apr 20, 2020

See Dhawal Shah's other Tweets

Figure 29. Most visited providers in 2020 (Shah, 2020).

Class Central (aggregator) states that in 2019, the total number of registered learners on the Coursera platform grew from 37 million to 45 million, allowing Coursera to remain the world's largest MOOC provider by a significant margin (Shah, 2019a).

In addition, Class Central explains that in 2019, edX achieved 24 million students, compared to 18 million students in 2018. Before that, edX was gaining 4 million learners a year (Shah, 2019b).

2) Coursebuffet is merely a site for searching and comparing various MOOCs. One can search for them by university, subject or provider. MOOC reports with trends and news are not developed in this case. Thus, there is no analysis of providers.

3) CourseTalk presents a list of platforms/providers that are rated highest by their community. Coursera and edX are the providers of the list with the highest valuation rates related to contents (10,101 and 26,523) and the highest valuation rates related to instructors (4,810 and 23400). Thus, they have more traffic by users than other platforms.

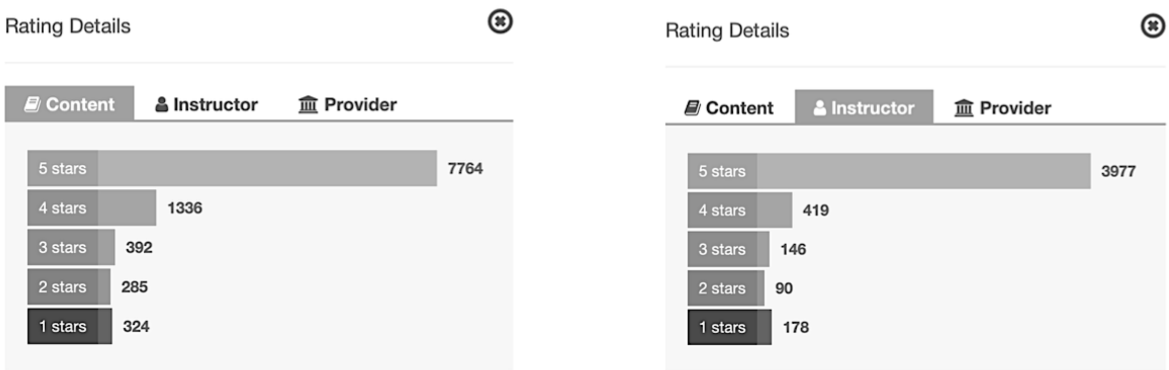


Figure 30. Coursera rating for content and instructor (Coursetalk, n.d.).

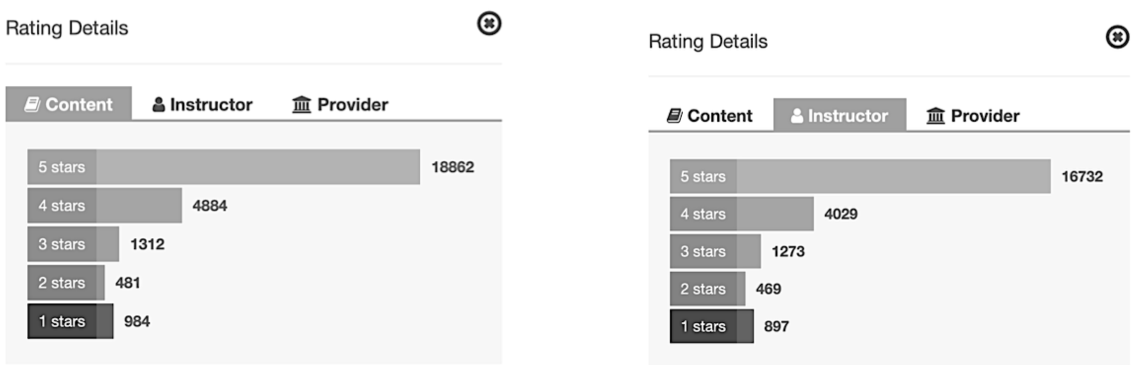


Figure 31. EdX rating for content and instructor (Coursetalk, n.d.).

4) MOOC-List.[24] Users can access this site to find multiple MOOC criteria and free online courses, courses from Coursera, edX, FutureLearn and other top platforms/providers and universities in a broad selection of categories and subjects. One cannot find MOOC reports or reviews about their results and performance, however.

In addition to what was found in the previous four aggregators, I needed to confirm the previous results by a search for more articles that recommended the most popular and interesting platforms. This search for articles through Google used the following keywords: “best platforms”, “best MOOCS”, “best practices in online learning/MOOCS”, and “effective teaching in MOOCs”. In addition, I considered the following aspects: (1) choosing the newest articles from 2018 onwards, and (2) journals/magazines/articles providing information in the area of online education.

The first article I found was from <https://www.reviews.com>, a research informant who published an article on “The Best MOOC platforms” by Reviews Team in December 11, 2018. To select the best platforms, Reviews considered different criteria such as: (1) platforms in English, (2) those platforms that have solid experience in delivering MOOCs, and (3) those platforms that have developed MOOCs with experienced instructors and multiple institutions. After these considerations, the two best platforms chosen by Reviews were as follows: (a) Coursera. “Best for: learners who want access to the most MOOCs and widest variety of learning pathways” (Reviews, 2018) and (b) edX. “Best for: Those who want access to free courses on the widest variety of topics” (Reviews, 2018).

[24] MOOC List. Retrieved from: <https://www.mooc-list.com>. Last accessed May 21, 2020.

Maketecheasier, a tech site focused on information technology tutorials, contained an article "4 of the best MOOC platforms for online learning and getting a degree" which indicated the best platforms of 2018 (Braun, 2018). The best two were Coursera and edX: (a) "Coursera comes in first because it has the most of everything: students, courses, university partners – all the ingredients of a good MOOC" (Braun, 2018), and (b) edX. "The second-largest MOOC platform certainly doesn't come in second for innovation and usability. It was founded as a non-profit run by Harvard and MIT and therefore offers a broad selection of courses from those universities and many others" (Braun, 2018).

Finally, Upwork published an article "Top 10 websites for online education in 2018" (Guest Contributor, Jan. 25 2018). Their ranking list resembled the previous example. In first place was Coursera, second edX, and in third place Udacity.

Turning to the criteria listed in this section (1.4.1.3.1.) to choose those platforms that have most impact on the MOOC field of study in terms of number of students and English language, were Coursera and edX. These platforms were part of study object in this research. A brief description of each is provided below.

Coursera:

> Coursera is a non-profit company that was started by Stanford computer science professors Andrew Ng and Daphne Koller in 2012. The two professors first offered Stanford courses online in 2011 and were so inspired by the experience that they decided to start a company that offers MOOCs. The platform currently has 25 million registered learners and partners with 149 universities across 29 countries. (NGO, 2020)

EdX:

> The fee structure for edX is similar to that of Coursera's. You can audit courses for free, but you won't have access to the whole experience. You don't get any sort of certificate for finishing a course you audit, so you'll have to pay a fee if you want to show off your progress to your peers or employer. A nonprofit company that was founded in 2012 by Harvard and MIT, edX currently partners with top institutions all over the world. One aspect of edX that makes the platform stand out is that its technology is open-source – this means that partner institutions can improve and add features that benefit the audience they are trying to reach. (NGO, 2020)

This selection consisted of choosing from the institutions, particularly the providers/platforms that had adopted a strategic approach, had continually invested in the development and the continuous improvement of MOOCs, had greater presence in online education and included a large number of students, according to the previously described in this section.

1.4.1.4 Data analysis process

Document analysis involves searching, reading, and interpretation. This constant process of search includes content and a thematic analysis (Bowen, G. A., 2009: 6).

Content analysis leads in the process of the categorisation of information regarding research questions (Bowen, 2009: 6). This allowed me to organise the main topics for development in the study, such as: (1) How MOOCs are designed currently, (2) what processes and procedures are included when a MOOC is going to be launched, (3) what tools are included in the design processes of MOOCs, (4) what factor work best in encouraging student participation, and (5) what role students have in the design of MOOC curricula, and to what extent this participation is beneficial. These are the main topics of the study, and the research was organised accordingly.

New topics emerged, framed within the main themes as a result of the thematic analysis. This became a more focused re-reading and review of data (Bowen, 2009: 6). A more detailed review of information allowed me to code and construct various categories in the above-mentioned themes. These included (1) what kinds of MOOCs are institutions focusing their academic and teaching and learning strategies on, (2) After a systematic review of processes and procedures, I identified all those aspects that instructors considered when they were going to launch a MOOC, (3) what tools were preferred by institutions and students, and of course, the most recent versions, and (4) what level or form of student participation was involved in the design of MOOC curricula.

This categorisation was particularly useful in identifying the processes, procedures and tools included in the MOOC design process. After a careful search using search engines such as Google, the Quality reference Framework (QRF) for the Quality of MOOCs (2018) was chosen for the research. This was a project developed by MOOQ. MOOQ is the European Alliance for Quality of Massive Open Online Courses. This project was completed by this Alliance team, in close collaboration with universities and institutions from The Netherlands, Greece, Portugal and France (Lyon) (Stracke et al., 2018). The QRF enabled me to deepen and categorise data related to the second specific objective: ‘To identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation’, and the third specific objective: ‘To collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation’.

With reference to the fifth specific objective: ‘To analyse the role of student participation in the design of a MOOC curriculum’, the forms and different levels of student participation were identified in a bid to determine whether student participation in curriculum design was beneficial or not.

1.4.1.4.1 Phases and processes implicated in the design of MOOCs

With reference to the Quality Reference Framework for the Quality of MOOCs, the phases to launch a MOOC are described below (analysis, design, implementation and evaluation). Some of the required processes in each of these phases are represented in the following table. These are the most significant.

The focus of this research was the design phase, and the processes involved.

	PHASES TO LAUNCH A MOOC			
	ANALYSIS	**DESIGN**	**IMPLEMENTATION**	**EVALUATION**
PROCESSES	NEEDS and DEMAND ANALYSIS	**ORGANIZATIONAL CONCEPT**	PROVIDE A SET OF GUIDELINES AND INSTRUCTIONS	EVALUATION PLANNING (e.g. REDUCE DROP-OUT, INCREASE ENGAGEMENT and MOTIVATION...)
	IDENTIFY TARGET LEARNERS	**CONTENTS and LEARNING ACTIVITIES**	ENSURE CONTENT MAINTENANCE	EVALUATION REALIZATION (USE SURVEYS, QUESTIONNAIRES, ...)
	ENSURE EACH OF THE CORE STAKEHOLDERS IMPLICATED IN THE MOOC	**TECHNICAL CONCEPT**	ENSURE NEW MATERIALS CREATED FOR MOOCS	EVALUATION REVIEW (IDENTIFY AREAS FOR IMPROVEMENT (e.g. CURRICULUM DESIGN...)
	DEFINITION OF OBJECTIVES	**COMMUNICATION and FEEDBACK**	USE OPEN SOFTWARE PLATFORMS and THE USE OF EXTERNAL SERVICES (YOUTUBE...)	REGULAR INTERACTION WITH PLATFORMS AND DESIGNERS TO REPORT BUGS AND PROPOSE IMPROVEMENTS
	ASSESS THE RELEVANCE AND POSSIBILITY OF ACREDITATION (paid or free) CERTIFICATION	**CONCEPT FOR TESTS and ASSESSMENT**	ENSURE PILOT TESTING OF THE MOOC and ALL OF THE LEARNING RESOURCES	

Figure 32. Phases in the launch of a MOOC.

The processes involved in the design phase are:

a) Learning objectives

b) Organisational concept and roles

c) Didactic concept and methods

d) Concept for content

e) Concept for learning activities

f) Technical concept

g) Media design

h) Communication concept

i) Interaction concept

j) Feedback concept

k) Concept for tests and assessment

From each of the processes, I chose those factors that I could observe on the website. Once I had collected all these factors, I defined the two ways of proceeding: (1) doing a statistical study, with a descriptive method, in some cases, (2) and a search of publications and other studies, using a qualitative method. The aim was to identify the most appropriate conditions, also called factors, that facilitate or foster student participation. In other words, to identify whether there was any relationship between a particular factor and student participation/engagement.

Before starting with the definition of each process and procedure, one can find a description of the two dimensions described in the QRF document below. This is a reminder of section 4.3. 'Instructional design process of a MOOC using an ADDIE model'.

Dimension 2 (Perspectives). At the beginning of each defined procedure one can find the following legends describing the following.

(P) pedagogical

(T) technological

(S) strategic

Dimension 3 (Roles). At the beginning of each process one can find the following legends describing the following.

(D) Designer

(F) Facilitator

(P) Provider

(R) Responsible. In case one of these three role players was the responsible for the process.

(X) Involved. Describes the role players implicated in each process.

Factors classified by process

a) 'Learning objectives' process

Role players: Designer (R), facilitator (X), and provider (X)

According to the main fundamentals of instructional design, the definition of learning objectives is the most required and meaningful part in the design phase when a learning course is being launched. Instructional design can have an important and substantial impact on student learning (Zhu, Bonk & Sari, 2018: 206). Thus, it is essential that students are provided with a route map and destination points.

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
LEARNING OBJECTIVES	How are the learning objectives defined (e.g. knowledge, skills, competences, topic-driven, content-driven, target-group-driven, task-driven)? (P)	i. The target audience of the MOOC ii. Prerequisites iii. Main aim of the course iv. Main objectives of the course v. Design of Learning objectives vi. Other ways of determining the learning objectives – What you will learn vii. Skills you will gain viii. Course handouts
	Which entry-levels are the learning objectives addressing (e.g. beginners, intermediate, advanced, novice, experts)? (P)	i. Level of the course: introductory, intermediate, advanced
	How are the learning objectives assessed (e.g. formative assessment, weekly quizzes, multiple choice tests, delivery of a product, essay, final exam)? (P) (S)	i. Evaluation of learning objectives: through weekly quizzes, multiple choice tests, final exam.

Figure 33. Learning objectives.

How are the learning objectives defined (e.g. knowledge, skills, competences, topic-driven, content-driven, target-group-driven, task-driven)? (P)[25]

In terms of MOOC format, it is interesting to note that the results of key demographic information on MOOC instructors stated that only 35% (50 of 143) of the interviewed instructors taught with a teacher's assistant for support, 22% did not have enough support, 23 MOOCs were self-paced, and 23 of them were learner-driven. The rest, 4%, were hybrid or blended types of MOOCs (Zhu, Bonk & Sari, 2018: 213).

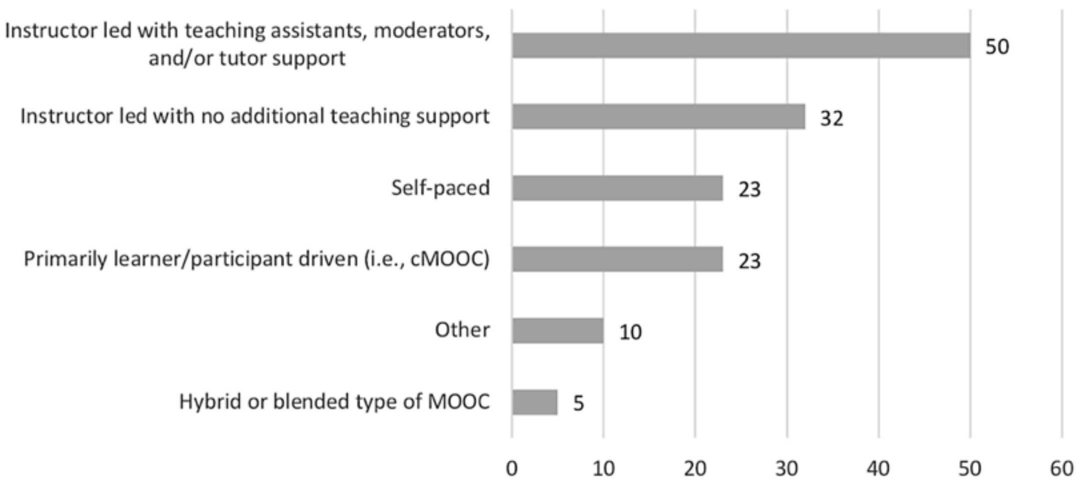


Figure 34. MOOC delivery format (Zhu, Bonk & Sari, 2018: 213).

In these courses, 38% of respondents' MOOCs had fewer than 5,000 learners, 21% had 5,001–10,000 learners, 13% had courses with 10,001–15,000 learners, 5% had courses with

[25] More detailed information in the previous section 4.3. Three perspectives: (P) pedagogical, (T) technical, and (S) strategic.

15,001–20,000 learners and 23% had courses with more than 20,001 learners (Zhu, Bonk & Sari, 2018: 214).

Constant teaching support is required. Zhu, Bonk and Sari state that one of the design challenges in MOOCs is the provision of immediate feedback to students (2018: 208). The large numbers of students is one of the most important factors that must be considered, and focused on and solved.

Wong (2016: 105) argues that "[t]he massive scale of MOOCs implies a low instructor-to-learner ratio". In this regard, universities toned to establish and define what the course can provide for students and compensate for "the lack of instructor support for students in the MOOC environment" (Wong, 2016: 106). Thus, universities must keep in mind that each MOOC will have to approach this topic very carefully. The aim is to define a balance between the number of teaching staff and the number of students in a MOOC in order to ensure an effective learning environment. The goal is a student participation rate is higher than previous years.

"As MOOC instructors have to take care of a very large numbers of students, they can provide little individual attention to each student, which may have an adverse effect on their learning outcomes" (Wong, 2016: 105).

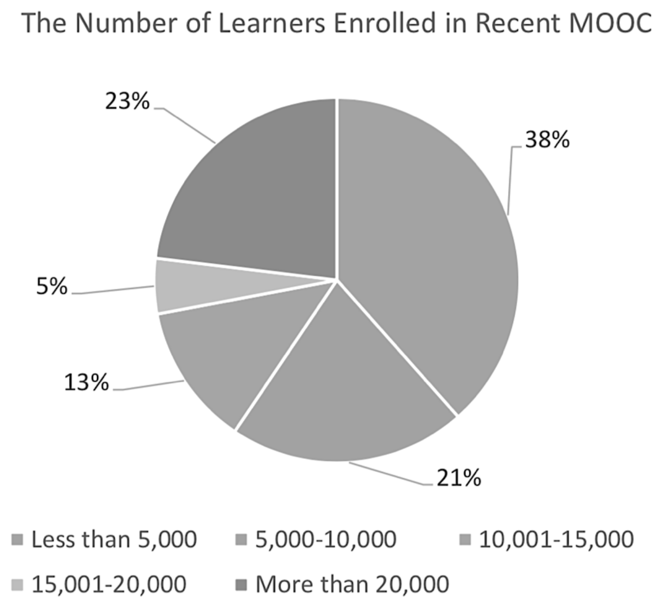


Figure 35. The large variation in numbers of learners enrolled in selected MOOCs from 2018 (Zhu, Bonk & Sari, 2018: 214).

According to the QRF, a team must be assembled to start the planning, design, development, and implementation of the MOOC. This team should include a designer, a facilitator and a provider. These roles were defined in the previous section 4.3.

i. The target audience of the MOOC

During the design phase, one of the aspects that MOOC designers should consider is the target audience of the course. As the number of participants in a MOOC is usually massive and heterogeneous, therefore a classification and a distribution of participants among the different supervisors/instructors would be the most appropriate. Similarities such as: (1) academic background, (2) the learning stage students are at, for example undergraduate, graduate, postgraduate, lifelong learners, or professionals, (3) country of origin, (4) age and (5) motivation and assignments provided by instructors to students, would be the most relevant considerations when assigning a group to a specific instructor/supervisor. A brief survey including only two or three questions would elicit enough evidence to classify students.

Below is the classification of the target audiences I identified in the observed MOOCs. The aim was to determine the kind of target audience that would be most involved and committed to online training.

Classification of findings:

(0) Bachelor. The MOOC is focused to an audience at bachelor or undergraduate level of knowledge.

(1) Master. The MOOC is addressed to an audience with a master's level of knowledge.

(2) Others:

- Hors programme: "In French, this can be used in an educational context (extra courses or classes on top of the regular curriculum) or in a musical one (extra piece added to the regular programme for a given evening/concert/performance)."[26]
- Propedeutic: Found 'propaedeutic' **"**preparatory study or instruction"[27]. It is a "preparatory education" for an introductory course into an art or science.
- None

[26] Hors programme. Retrieved from: <https://forum.wordreference.com/threads/french-expression-hors-programme.67699/> Last updated February 8, 2020.
[27] Propedeutic. Retrieved from: <https://www.merriam-webster.com/dictionary/propaedeutic>. Last updated February 8, 2020.

ii. Prerequisites

Have MOOCs defined prerequisites as a prior condition to access the course? Such prerequisites would be focused on qualifications, requirements or qualities that students should have to enrol in a MOOC. This would allow academic staff to ensure that they could teach at a specific level of knowledge.

The question of target audience gave rise to an attempt to detect whether in courses where the target audience was more specialised or where the content was more focused on the needs of the group, students would be more engaged and have more commitment to the MOOC. In other words, if student participation was considerably higher than in a course where the target audience was not specific.

Classification of findings:

(1) Yes, the MOOC has added prerequisites to access

(2) No, there is not any prerequisite to access to the MOOC

iii. Main aim of the course

The aim of the course is a general statement about an overall goal. Aims are strategies, in contrast to objectives which are tactics. Objectives are the measurable stages that students will go through and need to achieve in order to attain the overall goal.

Aims are intended to describe what the instructor tackles in the MOOC. Course aims are statements that describe the overall intentions of a course. These should answer two questions:

- What is the purpose of the course?
- What is the course trying to achieve?

These should be short, concise and provide students with the main idea that a course is going to tackle (UCA Creative Education Network, 2019a).

In the observed MOOCs I found several ways of establishing the main aim of the course.

Classification of findings:

(0) About this course: A mere enumeration of the topics by academic staff. These are described such as a general understanding of the basic principles of the course with a basic explanation.

(1) About this course: More accurate explanation by academic staff. An overview of all the topics, but this time course aims were described more concisely with overarching intentions that focused more on the results of the course.

The approach was to determine whether thorough planning of the course had been done by academic staff, and whether this was reflected in the definition of the aim and objectives of the course and indicated to students. This factor might be perceived and valued by students as a determinant factor, making them feel more confident and committed to the MOOC. Thus, student participation rates would possibly be high.

iv. Main objectives of the course. A quick overview of the topics that will be developed in the course

Once a student knows what he/she can expect from a course, the main objectives of the course must be made clear to students. Learning outcomes reference the skills students should have acquired after the successful completion of the course (UCA Creative Education Network, 2019b).

Learning outcomes should also be short, concise, precise, concrete statements about what students will be able to do at the end of the course. These acquired skills will be the outcome of the learning process. Learning objectives describe learning outcomes. They help instructors to focus and organise teaching and learning. In fact, learning objectives should be designed based on knowledge, skills and attitudes. Furthermore, they also help instructors to assess learning progress.

Related to this factor, I found the syllabus in my observation of MOOCs. Learning outcomes are the required statements that constitute a syllabus.

These were several options that I found in the observation of MOOCs regarding the main objectives of the course. The classification of findings is provided in the 'syllabus' section:

(0) No syllabus is provided to students.

(1) A syllabus is provided but it is a simple description, simply a list of topics. Not organised into weeks. A simple enumeration of the topics that are developed or a list of topics organised by weeks, but very simple.

(2) Syllabus, defined per week, type of activity and time before enrolling in the MOOC.

(3) Syllabus, displayed as a list of chapters or topics.

v. Design of learning objectives each week, after enrolling, during the course

How does one define effective learning outcomes that let instructors know whether students are understanding the contents? A helpful recommendation is to define learning outcomes using statements such as 'by the end of this unit students will be able to…+ infinitive'. The previous section discussed the syllabus provided at the beginning of the course; now, learning objectives are provided at the beginning of each lesson.

Some recommendations are helpful when setting out how learning objectives/outcomes should be expressed: (1) use the future tense: "by the end of this unit students will be able to…+ infinitive", (2) do not overload student with too many of them (between three and six), (3) academic staff should consider how they are going to assess each outcome, (4) use appropriate language addressed to students, (5) focus on the process that students should undertake more than on what they receive at the end. For instance, "students will be able to plan, promote, organise and put on an art exhibition" (UCA Creative Education Network, 2019b).

Keeping this in mind, I established whether the fact that MOOCs contained a comprehensive description of learning objectives was instrumental in making students feel more committed and confident about undertaking the course, and possibly ensuring a participation rate above 50%.

Classification of findings:

(0) No list of learning objectives in observed MOOCs.

(1) Simple learning objectives on a weekly basis are defined and displayed to students.

(2) Elaborated and accurate learning objectives are defined on a weekly basis.

(3) There is no information related to learning objectives.

vi. Other ways of determining the learning objectives – What you will learn

In the observed MOOCs I found learning objectives expressed differently in a bid to make MOOCs more appealing and understandable to students. This section was called “What you will learn” during the course on one of the platforms. This was a marketing strategy that attempted to appeal to students and encourage them to weigh up the added value that they could acquire after successfully completing the course.

As an outside observer, I identified two different ways in which MOOCs showed students the learning outcomes. They were defined as: (1) what you will learn, and (2) the skills you will gain.

The following is the classification of findings from the first choice, “What you will learn” on platform 1; only one platform offered this factor in this mode.

(0) No description of competences that a student would have attained when he/she had finished the MOOC.

(1) A simple description of competences was provided to students.

(2) A more accurate description of competences was developed and reachable by students.

vii. Skills you will gain

This time I found learning objectives displayed in another form. They were expressed as skills that students would have attained when they had completed the training.

Currently, we live in a society that is constantly evolving. Students need to know immediately what training would be most suitable to enhance their skills so that they meet the requirements of the job market.

When a student chooses to engage in specific training, he/she considers not only the technical knowledge, but also transferable competences that he/she should develop in order to be successful.

Thus, in order to appeal to students and to make them feel that this is their appropriate course, the design and communication of learning objectives as well as other aspects of the course should be clear and understandable. The aim is to assure students that this training will meet their needs. Furthermore, the more accurate a MOOC is in the design and articulation of its objectives, the more likely students will be to believe that this is a high-quality course. Thus, they will feel more committed and involved in the course.

In this section, I have attempted to identify whether the fact that students have within their reach the skills they should attain when they finish the training successfully, encourages them to feel more committed and involved in the MOOC, thus encouraging high rates of student engagement.

The types of defined skills are: Communication, analytical and research, flexibility or adaptability, transferable competences, make decisions and solve problems, planning, organisation and prioritisation, a change of roles (deal with different projects and individuals), attention to detail, self-confidence, public speaking, tactfulness, creativity, ethics and integrity, strong work ethic, ability to accept and learn from criticism, sales and marketing, computer and electronics, mathematics, and programming (Christodoulou, 2013).

The classification of findings was as follows:

(0) MOOCs in which one cannot find described skills that students will gain during the course.

(1) MOOCs in which the skills students will attain once they finish the learning process successfully are described.

viii. Course handouts

Some MOOCs provide course handouts to students in pdf format. [They] "are links to files that you upload in Studio, for example, a pdf version of the course syllabus, or an article that academic staff want learners to read. Learners see the list of course handouts under Handouts in the sidebar."[28]

[28] Handouts. Retrieved from: <https://edx.readthedocs.io/projects/edx-partner-course-staff/en/latest/course_assets/handouts_updates.html>. Last accessed July 1, 2020.

After I had observed the MOOCs, I became aware that this tool was not yet being used by instructors. Thus, it was not yet meaningful.

Which entry-levels are the learning objectives addressing (e.g. beginners, intermediate, advance, novice, experts)? (P)

i. Level of the course: introductory, intermediate, advanced

Do entry-levels of MOOCs have any influence on student participation? Which level of participants are the most committed and constant when they engage in a course? Is there a target audience that feels more sensitive and committed to maintaining their participation in a MOOC? The different entry levels of MOOCs that were found were introductory, intermediate and advanced.

Classification of findings:

(0) MOOC aimed at beginners.

(1) MOOC aimed at intermediate students.

(2) MOOC aimed at advanced students.

(3) There is no information related to entry level.

How are the learning objectives assessed (e.g. formative assessment, weekly quizzes, multiple-choice tests, delivery of a product, essay, final exam)? (P) (S)

i. **Evaluation of learning objectives through weekly quizzes, multiple choice tests, final exam**

I found that in all the MOOCs I observed the designers had chosen both formative and summative assessment. However, there was a more significant presence of formative assessment through discussion forums, weekly quizzes, small teamwork projects, homework assignments, and surveys. Despite this, there were many instructors who had used final projects, instructor-created exams, standardised tests, and final grades.

It is thought that implementing formative assessment strategies in a course enhances teaching and learning. Instructors encourage students to involve themselves actively during the course with the aim of learners self-assessing their own skills (Yale, Poorvu Center for Teaching and Learning, n.d.). According to the authors, below are seven formative assessment strategies that might help instructors to define what activities are most suitable in this regard: (1) developing systematic activities with the aim of students engaging in an effective learning experience, (2) fostering students' self-reflection in different ways such as through forum discussions, peer-review, and writing, (3) feedback from instructors should be based on concise criteria to provide students with tools that allow them to revise their proposals, correcting them rather than evaluating them, (4) inviting students to midterm evaluations and feedback sessions with the aim of reflecting on the course, and moreover, instructors would then be able to reply to students' concerns about learning goals and assignment criteria, (5) encouraging a constructive way of training, asking students to rewrite/resubmit assignments if necessary, (6) giving students opportunities to make the gap between the current and desired training smaller, and (7) collecting useful information from students to meet their needs.

As noted above, formative assessment was the most common method to guide in-process evaluations of student comprehension and learning process in the observed MOOCs. Online training requires constant supervision and a tracking of students’ progress by instructors. As MOOC users are usually experienced in their own discipline, students might provide useful information as the course develops.

As we saw in the figure 21 above, ‘MOOC design considerations’, the second aspect very important aspect for instructors when they design a MOOC is assessment. Zhu, Bonk and Sari (who mention Watson et al., 2016 in their paper) argue that one of the main design considerations is the type of student assessment (2008: 215). The most common types of assessment are discussed below (see section: k) ‘Concept for tests and assessment’).

b) 'Organisational concept and roles' process

Role players: Designer (X), facilitator (X), and provider (R)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
ORGANISATIONAL CONCEPT AND ROLES	What is the optimal length of a MOOC? (P) (T) (S)	i. Course length
	How are openness and free access guaranteed? (P)	i. Language: English
		ii. Transcriptions of videos: English, Spanish, Chinese
		iii. Free?
		iv. Providing a verified certificate at an affordable fee
		v. You can upgrade to verified certificate at any time during the course
		vi. Which institution? University?
		vii. Is financial aid available? Or a scholarship?
		viii. Meet the instructors
		ix. Issue: Hard sciences or soft sciences

Figure 36. 'Organisational concept and roles' process.

What is the optimal length of a MOOC? (P) (T) (S)

i. Course length

When a student enrols in a MOOC, the first thing he/she sees is 'course info'; this provides relevant information so that the student can organise and plan the commitment that he/she will have to assume.

According to previous research such a publication from North-Western University entitled "MOOC creation guidelines" (Northwestern University, n.d.) and the article "Course length recommendations in online Higher Education" by Burrus, Lynne and Shaw (2014), it is recommended that course length be about eight weeks. This period has benefits by allowing teaching staff to deliver the required contents without overwhelming students.

This consideration was clear in the MOOCs that provided several choices of course duration, expressing this in hours, or in weeks. Data are shown here by hours. Further on, in section c) 'Didactic concept and methods' process, particularly in factor 'Course structure: week 1, week 2, week 3...', data are displayed by weeks.

Below is the classification of findings from the observation of MOOCs:

(0) interval until 30h

(1) interval between 30h and 40h

(2) intervals between 40h and 50h

(3) interval more than 50h

Note: When information about hours to complete the course was reflected on the website, I noticed that the number of hours to complete was the minimum number of estimated hours of application. For example, when a MOOC claims that the course takes 44h to complete, this can be read as four to six hours per week, thus are 11 weeks. Platforms choose the minimum number of planned hours of the interval (4 - 6h) in order to attain the total number of hours to complete in the course, i.e. 44h. This practice is chosen as a marketing strategy in order not to frighten off potential students.

In my case, I classified the findings by maximum working hours that students were required to invest to complete the course. The reason was the feeling that when students really put this into practice, this would be a truer reflection of the time they would spend. Thus, students would realise that they had to work a total of 66 hours to complete the course.

How are openness and free access guaranteed? (P)

i. Language: English

Despite English being the language that has become the bridge connecting students from different language backgrounds, I wanted to investigate whether language was a motivational factor that ensured a high level of student participation. It may have been the case that the local language of the country that launched the MOOC had a greater impact on student participation.

Thus, is the language a critical factor in assuring high student participation in the course? Would the fact that it uses an international language such as English be an assurance of high student participation in a MOOC? Is the language an obstacle to pursuing an online course?

These are the classification of findings from the observations:

(0) English

(1) French, the local language

ii. Transcriptions of videos: English, Spanish, Chinese

There are many students who decide to enrol in a MOOC who are not native speakers of the MOOC language. Thus, the fact that videos have transcriptions in several languages could be motivation for students to enrol in a MOOC, helping them to pursue the course. This may keep student participation rates high.

The transcription of videos has several benefits, including: (1) accessibility for people with disabilities, and (2) better comprehension of contents. In the article: “8 benefits of transcribing & captioning videos” (2019), the author mentions that in a national research study conducted with Oregon State University, it was found that 52% of learners found captions helpful as an aid in their comprehension of contents during the learning process, (3) students can view videos in places where audio is not available, (4) this is a way to enhance SEO (search engine optimisation) and the number of video views. Transcriptions help to locate videos in the list of search engines such as Google, Bing, and so on. Perhaps providers could make some of these videos public with the aim of attracting appealing new learners, and (5) making translation into foreign languages easier (Edelberg, 2019).

The classification of findings from the observations was as follows:

(0) There are only transcriptions in English.

(1) There are only transcriptions in French, the local language.

(2) There are transcriptions in two or more languages.

iii. Free?

Does the fact that MOOCs are free have any impact on student participation? In other words, is the fact that courses are gratis an incentive for students to enrol for a course? What is more, is student participation greater? The reflection was as follows: Is the fact that MOOCs still in an early stage means that students do not consider them as formal as traditional courses? Perhaps a new approach to MOOCs, such as making them official training, is a requirement by institutions to ensure a higher rate of student engagement. Would including MOOCs in formal education make students feel more familiar with this kind of online training?

Classification of findings:

(0) Free to unlimited course access

(1) Free access, but no access to some of the upgraded quizzes or the final exam

(2) No information

iv. Providing a verified certificate at an affordable fee

In MOOCs, a student can upgrade to a verified certificate for a course. In other words, students can attain the highest level of engagement in a course by obtaining access to the whole course, and a verified certificate.

MOOCS use rewards/certificates/badges in the hope of maintaining high levels of student interest and engagement. This has not had the marked effect that MOOC providers had hoped for, however. Nonetheless, this has been helpful in recognising the effort of students during the course, and course completion by students. Therefore, a step forward has been achieved through MOOCs' use of this form of feedback to the students.

For example, the Coursera platform mentions that in order to pass the course and to receive a verified certificate, students will require a passing grade in assignments throughout the course, such as, quizzes, peer-graded assignments, and programming assignments, on one hand. On the other hand, instructional videos, readings, and practice activities, are tools to help students to prepare for the graded assignments (those activities that are included in the upgrade option, with fees attached).

Thus, providing a verified certificate is one of the strategies that instructors consider when they design and deliver a MOOC. This is the commonest way of engaging students in a MOOC, according to Zhu, Bonk and Sari (2018: 216). Over two thirds (68%) of instructors provided a certificate in a bid to keep students engaged in the course.

The platforms that I observed informed potential students that they would provide them with a verified certificate at an affordable fee. In fact, currently, as mentioned above, platforms use this strategy as a way of engaging learners. In addition, verified certificates are a badge to provide institutions with credibility that makes students feel confident about participating in their MOOCs.

On edX, for instance, the following can be found:

> A verified certificate is a certificate that requires learners to verify their identities using a webcam and a photo identification card. Verified certificates carry a fee that varies by course. Many learners use verified certificates for job and school applications. […]
>
> […] After purchasing the verified track and successfully completing photo verification you will be able to complete the graded assignments within the course. To receive a certificate, you will need a passing total score before the course end date. The minimum passing score needed and your total score is shown on the progress tab within the course. (EdX, n.d.)

No significant difference between platforms could be found with regard to this topic. Students can also upgrade to verify at any time during the course. The unique aspect in this case is a slight difference in the price set by MOOCs. The usual price is about $49.

Classification of findings:

(0) Free access. Unlimited access to the MOOC.

(1) Free access. However, no access to some of the upgraded quizzes or the final exam.

(2) There is no information about this topic.

v. You can upgrade to verified certificate at any time during the course

On both platforms one can find detailed information about getting a certificate. In both cases, students should fulfil three requirements: (1) fill in the ID verification, (2) pass all required assignments set in the MOOC, and (3) pay for or apply to be approved for the MOOC (the last choice, in cases of financial aid granted by the platform).

On both platforms, students can upgrade a verified certificate during or after the course at any time. A little restriction is found in edX where students can upgrade until ten days before the end the course. The fact is that students find any facilities to attain the verified certificate when they complete the training.

More information about two platforms can be found:

(1) Coursera: <https://learner.coursera.help/hc/en-us/articles/209819053-Get-a-Course-Certificate>. Last accessed June 21, 2020.

(2) edX: < https://support.edx.org/hc/en-us/articles/207204437-What-is-the-deadline-to-upgrade-to-a-verified-certificate->. Last accessed June 21, 2020.

The University of Copenhagen was one of the first universities that opted to provide students with verified certificates. Strong defenders of MOOCs, they believe that these courses provide an opportunity for students to lead to a better life and have a more interesting education. This approach allows students to have access to international professional work, and to acquire a global outlook on career opportunities (Lažetić et al., 2015: 24).

vi. Which institution? University?

I collected data from one university. However, confidentiality of the source was ensured. It is only possible to say that the university that was involved in the study is located in Switzerland, and is moreover one the pioneers in the MOOC initiative in Europe. I want to thank this institution for its collaboration that allowed me to develop and to complete this study. This is a note to make us aware that the data comes from a source with these characteristics. This has a direct impact on this factor, and of course, on results.

The institution works seamlessly with two platforms (edX and Coursera). Both are leaders in the MOOC sector in a bid to bring students around the world the best of higher education. They both offer free or affordable online courses, specialisations and degrees in a broad variety of subjects such as law, engineering, science, business, computer science, public health, social sciences, computer science, and so on.

MOOCs have become the best way to access universities that were unreachable in the past, for distance, monetary or accessibility reasons. Currently, students have the chance to access almost any university in the world that offers MOOCs. Despite the criticism around this topic, MOOCs have become a method of democratisation of education. Of course, MOOCs are not accessible to all students, but they are reaching students in numbers that were unthinkable in the past.

vii. Is financial aid available? Or a scholarship?

Currently both platforms offer financial aid/assistance to students.

> EdX offers up to a 90% discount on our verified certificates to learners who cannot afford to pay full price. Assistance is available in most courses that offer verified certificates; however, some courses and programs are not eligible. You can be approved up to five times in a twelve-month period for financial assistance. (EdX Learner Help Center, 2021)

Coursera says that students with financial aid can access to all course contents and complete all proposed assignments in the MOOC. Financial aid and scholarships only apply to the course for which the application was approved. However, Coursera also explains that if students are not granted financial aid, in most cases they can view most of the contents for nothing by using an audit mode. Auditing a MOOC enables students to benefit from a course, but without receiving a verified certificate or grade.

The requirements for applying for financial aid are: (1) register in a MOOC, and (2) fill in a financial assistance application. Then, the application is evaluated. Finally, an email with a financial assistance code is submitted to the student for a discount of 90%.

The application should include information on the student's educational background, career goals, and financial circumstances, as well as a commitment to complete the course by abiding by an honor code or code of conduct. In cases where the platform does not grant financial aid, students are reminded that they can access course contents in an audit mode.

More information can be found on the following sites:

- Coursera: < https://learner.coursera.help/hc/en-us/articles/209819033-Apply-for-Financial-Aid-or-a-Scholarship>. Last accessed June 22, 2020.
- EdX: < https://support.edx.org/hc/en-us/articles/215167857-How-do-I-apply-for-financial-assistance->. Last accessed June 22, 2020.

viii. Meet the instructors

In order to keep students hooked into a MOOC, it is important that instructors keep close to these students. Forming a bond between instructors and students make students feel more committed. Their learning process is more efficient and their marks are better.

Professors, also called instructors in MOOCs, are professionals, intellectuals, researchers, analysts, artists, musicians, writers, parents and more (Zegarra, 2019). Zegarra continues that a close bond can help deeper learning as academic staff can tailor the contents they provide because they know their students' needs.

There are different ways of forming and strengthening the bond between instructors and students:

(1) A presentation by instructors at the beginning of the course.

(2) Making students participate actively during the course.

(3) Keeping close to students by responding to all their doubts and suggestions in a short period of time. Students should have the feeling that they are constantly listened to.

(4) Be respectful and kind.

(5) Ask for constant feedback from students to know whether they are pursuing the course in the right way to achieve the defined goals.

In the observations, I found welcome videos before or after enrolling in the course, in which instructors made a presentation introducing themselves and the course contents. Furthermore, there were sections where instructors were presented, including data about their academic and professional careers. Both types of introduction were essential for students.

ix. Issue: Hard sciences and soft sciences

The study focused on MOOCs in hard sciences because the institution that provided the data has a mission focused on the hard sciences. Subjects such as Engineering, Maths, Physics and Biology were included in the MOOCs I observed. Below are knowledge areas covered in the sample of courses:

I investigated whether in student engagement was higher in some disciplines than in others.

Classification of findings:

(1) Architecture, Civil and Environmental Engineering

(2) Basic Sciences

(3) Engineering

(4) Computer and Communication Sciences

(5) Life Sciences

(6) Management of Technology

(7) Aquatic Science and Technology

c) 'Didactic concept and methods' process

Role players: Designer (R), facilitator (X), and provider (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
DIDACTIC CONCEPT AND METHODS	Which didactic principle is the focus (e.g. self-regulated learning, direct instruction, reflective learning, collaborative learning, emotional learning)? (P)	i. SDL (Self-directed learning), direct instruction, reflective learning, collaborative learning
	Are personalisation and selection of own learning pace and pathway realized? If, yes, how? (P) (T)	Self-paced
		Flexible learning
	What methodologies are used (e.g. active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based)? (P)	active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based
	How are the didactic principles and methods communicated to the learners (e.g. orientation module, introductory unit, task guidelines)? (P)	i. Workload/week
		ii. Course structure: week 1, week 2, week 3…

Figure 37. 'Didactic concept and methods' process

Which didactic principle is the focus (e.g. self-regulated learning, direct instruction, reflective learning, collaborative learning, emotional learning)? (P)

i. SDL (Self-directed learning), direct instruction, reflective learning, collaborative learning

As I mentioned in the previous section (3.3.2.3.), in this research study I did not focus on this aspect of how students learn. However, I was aware that this is an aspect to consider during the online learning process, and of course, instructors should consider it when they design a MOOC.

Wong (2016: 106) refers to SDL in his paper explaining that “Veletsianos and Shepherdson (2016) investigated the topics of empirical papers on MOOCs published in 2013-2015, which showed that more than 80 per cent of the topics were related to students, such as learner behaviours, performance, learner participation and interaction”.

Self-directed learning is another aspect considered by Zhu, Bonk and Sari during the MOOC instructional design process (2018: 217). In their study they found that 30% of respondent instructors answered that they strongly agreed with the statement that they considered learners’ self-directed learning ability when creating a MOOC. Forty-four percent (44%) of respondents answered that they agreed with the statement, 16% were neutral, and 9% stated they either disagreed or strongly disagreed with the statement. Thus, SDL should be considered by instructors during the MOOC instructional design process.

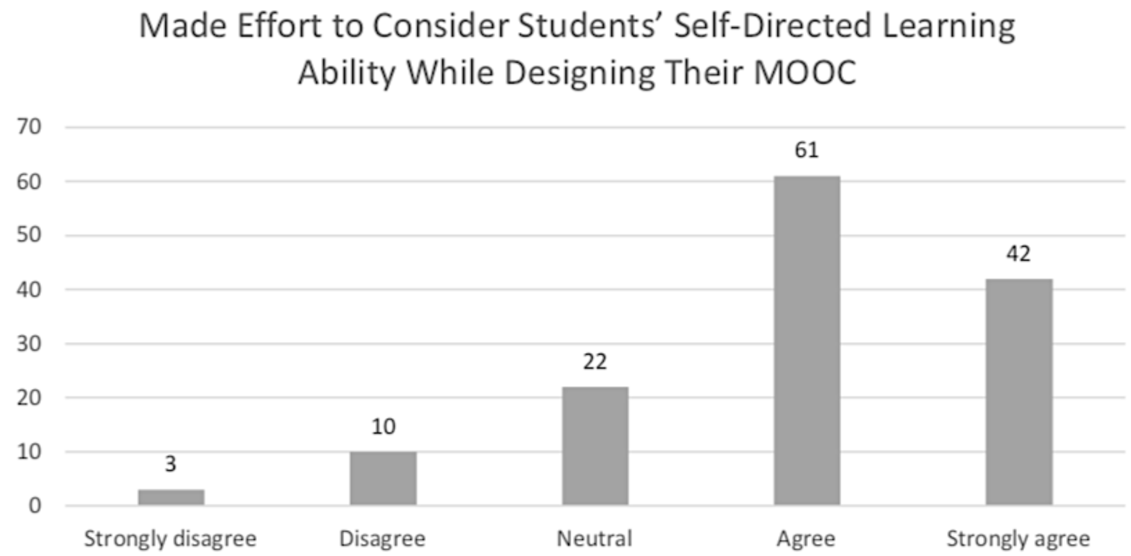


Figure 38. Effort expended when considering learners' self-directed learning ability (Zhu, Bonk & Sari, 2018: 218).

It is a fact that SDL is a relevant concept that instructors should consider when MOOCs are in the process of development. However, my methodological approach was focused more on what institutions could do to deliver a successful MOOC, rather than what students needed to do to successfully complete the course.

In the MOOCs I observed, I found the use of a mix of different methods, such as direct instruction, reflective learning and collaborative learning. All these were reflected in the course development. The approach was to keep students active and involved during the course.

I found that MOOCs used a combination of direct instruction and constructivist methods, in which instructors were guides and students were responsible for their learning. Students were at the centre of the learning process. There were individual and collaborative assignments, and all practices were focused on students.

Instructors present the contents of the course, in most cases through instructional videos performed by themselves. In other cases, there are presentations, reading papers, or provision to students of links with interesting information related to the discussion topic.

Reflective learning is a method that engages students through discussions. There are discussion forums linked to every explained topic. The aim is to provide a space where students can reflect on a topic, so that they can implement their analytical insight, reflection and critical capacity. Furthermore, collaborative learning is promoted by discussions and peer-assessment tools. Zhu, Bonk and Sari (2018: 215) found that pedagogical considerations such as collaborative learning support were one of the MOOC design considerations that instructors took into account.

Lastly, emotional learning or cultural sensitivity was considered in MOOC design by 30% of instructors in Zhu, Bonk and Sari's (2018: 215) study. Owing to the broad range in diversity of students, both emotional and cultural development, within a cultural context, are considerations that should be part of the MOOC design process.

Are personalisation and selection of own learning pace and pathway realised? If, yes, how? Self-paced and flexible learning (P) (T)

Anderson et al. (2014: 1) argue that when students engage in a MOOC that is not a self-paced course, the rate of students' who drop out of the course is meaningful.

Despite the fact that MOOCs are focused on a wide target audience, various scholars (Simonson & Maushak, 1996; Watson et al., 2016, cited in Zhu, Bonk & Sari, 2018: 223) believe that one of the best ways to encourage students to participate in a MOOC is through a flexible learning style. In other words, students should be allowed to personalise their training. In this regard, self-paced learning is one of the favourite strategies used by instructors to keep students engaged in a MOOC. Zhu, Bonk and Sari (2018: 216) found that 59% of instructors in their study used self-paced learning).

In all the observed MOOCs in this study I identified an awareness of this aspect. Most MOOCs offered flexibility or self-pacing to students. This allowed students to organise their workload.

What methodologies are used (e.g. active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based)? (P)

The use of active-learning strategies in the process of the design and development of MOOCs must ensure that students remain engaged in a course. Embedding an active learning pedagogy is one of the tools that Zhu, Bonk and Sari's (2018: 219) study found to be useful: 49% of instructors considered it meaningful to include strategies to engage students in active participation in the design process.

Among strategies that promote active learning that I found in MOOCs were peer-activities, group discussions, the role of instructors (essential to the success of an active learning tool is instructors who are committed to ensuring a learning environment that makes active learning possible), interactive learning activities (such as videos and online presentations), cooperative learning activities, activities that invite to reflection, and so on.

In fact, the use of active learning strategies is aimed at placing students at the centre of the learning process. In other words, they should take an active, participatory and critical role in connectivist learning through exchange, communication, collaboration and cooperation. In this regard, one could say that MOOCs are faithful exponents of active learning, connectivism and networked learning, providing a benchmark for the introduction of new technologies in education.

Based on the above considerations, MOOCs are network-oriented, task-based, interactive-based and problem-based. All these standards are essential when considering MOOCs' special features: (1) network-orientation is a way of connecting with students themselves, and strengthening the relationship between instructors and students; (2) all the observed MOOCs were task-based, that is based on proposed tasks or assignments. In fact, the basis of the courses was to organise the MOOC according to these criteria. MOOCs were organised firstly by weeks and secondly, by tasks or assignments. Students made progress within a course by completing the various assignments, such as instructional videos, quizzes, readings, discussion forums and peer-reviewed assignments, and (3) in some of MOOCs there were small projects to develop, were based on a problem-solving approach.

How are the didactic principles and methods communicated to the learners (e.g. orientation module, introductory unit, task guidelines)? (P)

MOOCs curricula were planned by weeks and topics. The topics included in the curriculum were distributed over a certain number of weeks. In most courses, a topic was completed, i.e. developed and assessed, by the end of a week.

i. Workload/week

When a course is created, it is necessary to determine (a) the average weekly time students will have to dedicate to it (time/energy) and (b) course length. It is important that students know this from the start, even before they have made the decision to enrol for the course, because this information could deter them from enrolling in the first place. “[Some] studies found that about 90% of students drop out mainly due to two main reasons: time management issues (e.g. conflicting real-life responsibilities) and the loss of course rhythm (e.g. left behind due to work, travel or illness)” (Hew, 2015: 325). It is therefore very important for students to know how much time they will need to invest in a course, and how they can integrate this training into their daily life.

The ideal, found in the literature and previously mentioned, would be around five hours per week (Burrus et al., 2014).

Classification of findings:

(0): 1-3 hours’ workload per week

(1): 4-6 hours’ workload per week

(2): 7-10 hours' workload per week

As explained in the previous section i. 'Course length' in the 'organisational concept and roles' process, when classifying the observed MOOCs I chose the higher number of hours of the interval found on the website.

ii. Course structure: week 1, week 2, week 3...

This factor was found in several modes. However, small differences in the organisation of course data can be decisive in whether students decide to keep working in a MOOC. Course length factor data are expressed in hours. However, sometimes the course is structured by weeks. I wanted to investigate whether the distribution of the workload by weeks could provide meaningful data. How would students assimilate this information? Was this factor relevant to them?

The monitored MOOCs had the following variables:

(0): 1-4 weeks

(1): 5-7 weeks

(2): 8-11 weeks

d) 'Concept for content' process

Role players: Designer (R), facilitator (X), and provider (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
CONCEPT FOR CONTENTS	How is the content structured (e.g., entry level – beginners, intermediate, advanced, novices, experts, units, modules, themes)? (P)	The structure of contents for beginners, intermediate and advanced learners.
	What media and presentation types of content are used? (P) (T)	Media types
	What are the sources of the content (e.g. re-use, self-development, contributions, external contracts, mixed approaches)? (P) (T)	i. Embedding supplementary course materials

Figure 39. 'Concept for content' process.

In Zhu, Bonk and Sari's (2018: 217) study, they found that 46% of the instructors who took part in their study considered learning contents that would be delivered to students during the MOOC design process. In addition, they asked what types of learning resources they provided to students. Results showed that some of most relevant were the following: (1) animations and other types of animated or interactive contents, (2) instructor blogs, (3) instructor lecture notes, (4) learner blogs, (5) mobile applications, (6) PowerPoint and other presentation slides, (7) readings, (8) social media (e.g. Facebook, Instagram, Snapchat, Twitter, etc.), (9) videos (such as TED talks, YouTube, etc.) and (10) video lectures, tutorials and conferences (Zhu, Bonk & Sari, 2018: 236).

The vast amount of information accessible to students is a characteristic of MOOCs. The material of the course must be organised and structured by academic staff beforehand. "The massive and disorganised information on discussion forums" (Wong, 2016: 106) is a fact in the literature. "Too many simultaneous discussions and interactions in a MOOC paralyse the participants who attempt to catch up with the key postings and follow the course schedule" (Wong, 2016: 106). The delivery of content should be progressive. Thus, it is vital that this factor is also a part of the design process. For this reason, a comprehensive assessment is required in order to deliver MOOCs in a more effective way without overstraining students.

How is the content structured (e.g. entry level – beginners, intermediate, advanced, novices, experts, units, modules, themes)? (P)

When an instructor designs a MOOC, he/she must specify the learning paths, depending on the selected difficulty level. The structure of contents for beginners, intermediate, advanced, or other criteria, should be defined at the beginning of the course. The terms 'level of the course: introductory, intermediate, advanced' define the level of target audience for the course. At this point, instructors filter on the level of students. Thus, in the observed MOOCs there was no difference within each course as far as levels of contents were concerned. Instead, contents were structured by modules and themes and organised by weeks.

What media and presentation types of content are used? (P) (T)

i. Media types

Using multimedia has several advantages in the student learning process.

1) Media stimulate students, allowing them to increase their attention span and retention, 2) they facilitate the learning process, making learning easier, 3) media engage students and

provide them with rewarding learning opportunities, 4) media enhance reflection capability, and 5) media help instructors to create a set of resources that allows them to meet students' needs more effectively (Chioran, 2016, Bhaskar, 2013).

Different types of media elements and tools are available for the development of a MOOC. Some of these are discussed below (Zhu, Bonk & Sari, 2018: 218).

a) Social media as Facebook, Twitter, Instagram, Snapchat, Pinterest, etc.
b) Social media interactions through discussion forums, blogs, chats, podcasts, wikis, peer-reviewed assessments, all of which enable students to work in teams to create a network in a specific topic.
c) Different types of media (instructional videos, audios, images, animations, texts, graphics, storyboarding, slideshows) help students to learn because not only are learning contents assimilated through text, but also through visual images. It has been demonstrated that students develop other required transferable competences.

What are the sources of the content (e.g. re-use, self-development, contributions, external contracts, mixed approaches)? (P) (T)

i. Embedding supplementary course materials

Embedding supplementary course materials is a usual practice in MOOCs in order to complement contents. In Zhu, Bonk and Sari's (2018: 217) paper, 67% of instructors considered this meaningful and, in fact, included supplementary course materials such as "readings, animations, simulations, maps, job aids, news, videos, etc." in the MOOC they designed, delivered and guided (2018: 236).

The VideoLectures portal from Slovenia is one of many examples of sources that one can find online, where high-quality didactic contents are available to scholars, scientists and of the general public. Another example is Universia OCW, developed in Spain; 11,000 universities took part in this project, from 15 countries including Andorra, Argentina, Brazil, Chile, Colombia, Spain, Mexico, Panama, Paraguay, Peru, Portugal, Puerto Rico, Dominican Republic, Uruguay and Venezuela. This project offers information and contents to 10.1 million students, eight million users and 850,000 professors. All contents are subject to a Creative Commons license.

With these two examples I want to show the countless number of sources that instructors have at their disposal for use in MOOCs. All of them can be adapted to suit MOOCs. In addition, there is of course the content developed by instructors themselves.

e) ‘Concept for learning activities’ process

Role players: Designer (R) and facilitator (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
CONCEPT FOR LEARNING ACTIVITIES	What individual, peer and group activities are included (P) (e.g. self-test quizzes, peer-reviewed activities, small group case study)?	self-test quizzes, peer-reviewed activities, small group case study
	How can learners monitor their learning progress (P) (e.g. progress bar, weekly generated feedback or checklist)?	Students must be able to clearly see where they are with respect to the entire course

Figure 40. ‘Concept for learning activities’ process.

What individual, peer and group activities are included (e.g. self-test quizzes, peer-reviewed activities, small group case study)? (P)

Various learning activities are used by instructors in order to engage students in MOOCs. These include watching instructional videos, submitting assignments, taking part in quizzes and writing exams, participating in forum discussions where they can discuss a particular topic, solving problems, offering advice, and exchanging interesting information. In this section, I discuss types of learning activities that students might find in a MOOC.

Firstly, individual activities are those that students perform and submit independently from others, such as watching video lectures to keep track of contents, and related self-test quizzes to check whether they have assimilated the knowledge correctly.

Secondly, group activities are a set of activities such as peer-reviewed activities and small group case studies where students exchange knowledge and create a bond by learning a subject collaboratively. As MOOCs have large enrolments, instructors use peer-reviewing as a strategy to facilitate the correction of assignments. Furthermore, peer-review is used as an active learning strategy. Formative peer-assessment can help students to identify their strengths and weaknesses, and to develop and manage their learning process (Odom et al., 2009: 108-109).

This is the classification of findings that was evaluated statistically:

(1): Peer-review, peer assessment

(2): No peer-review, no peer assessment

How can learners monitor their learning progress (e.g. progress bar, weekly generated feedback or checklist)? (P)

i. **Students must be able to see clearly where they are with respect to the entire course**

Another aspect to consider in the MOOC design process "is monitoring or tracking learners' learning progress". 37% of surveyed instructors used modular-based progress data to track learning, 35% of the instructors allowed students "to do self-monitoring and self-evaluation". Fewer than a quarter (18%) of surveyed instructors "asked moderators or teaching assistants to monitor learning". Only 15% "did not monitor learner learning progress in the MOOC" (Zhu, Bonk & Sari, 2018: 218).

f) 'Technical concept' process

Role players: Designer (X), facilitator (X), and provider (R)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
TECHNICAL CONCEPT	What kind of technical support will be offered to staff and learners? (P) (T) (S)	i. An explanation of the e-skills required to complete the course. Which e-skills are needed?
		ii. Demo-course: How to navigate through the course.
		iii. Bookmark (any courseware page)
		iv. Updates (if there are any)

Figure 41. 'Technical concept' process.

What kind of technical support will be offered to staff and learners? (P) (T) (S)

i. An explanation of the e-skills required to complete the course. Which e-skills are needed?

A student must be given a straightforward, visual explanation of the e-skills that are required to successfully complete the MOOC. This should be a simple explanation or tool that does not require much effort to understand how the course works. If students are required to invest a great deal of time in reading up on what is required of them, this could be a deterrent to signing up in the first place.

ii. Demo-course: How to navigate through the course

This is a tool that was developed particularly for those students who were making their first contact with a MOOC. There are similar explanations on both platforms (edX and Coursera).

EdX is the platform that makes use of the opportunity to display a visual example of how to complete the course. From my viewpoint this is an excellent way to show all students who have not experienced an online course how it works.

One can find more information in the following link about edX: <https://www.edx.org/course/demox>. Last accessed July 1, 2020.

With reference to Coursera, interesting and detailed information can be found by potential learners. More information can be found below.

Coursera: <https://learner.coursera.help/hc/en-us/articles/209818603-Enroll-in-a-course>. Last accessed July 26, 2020.

iii. Bookmark (any courseware page)

This is an interesting and useful tool developed in edX. It allows students to bookmark a place, site, article or something they are reading. During the course, students always have at their disposal those selected, preferred contents that they have found relevant to reach their learning goals, and which they have bookmarked.

One can find more information on this topic at: <https://support.edx.org/hc/en-us/articles/216952977-Can-I-bookmark-a-place-in-a-course->

iv. Updates (if there are any)

There is a chance to add course update on edX. These are communications that students see at the top of the course page, particularly welcome messages that provide orienting information that could help them to pass the course. More information can be found in: Course Updates. Retrieved from: <https://edx.readthedocs.io/projects/edx-partner-course-staff/en/latest/course_assets/handouts_updates.html>. Last accessed July 1, 2020.

g) 'Media design' process

Role players: Designer (R), facilitator (X), and provider (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
MEDIA DESIGN	Which types of media will be used (e.g. video lectures, digital text, animations, simulations)? (P) (T)	i. Are there multimedia tools such as videos, audio clips or images?
	Which media concept will be followed (e.g. interactive media)? (P) (T)	

Figure 42. 'Media design' process.

Which types of media will be used (e.g. video lectures, digital text, animations, simulations)? (P) (T)

i. Are there multimedia tools such as videos, audio clips or images?

It is widely demonstrated that the use of multimedia tools such as images, audio, videos, interactive surveys and techniques such as discussion forums, encourage students to be more interested, involved and committed to the course, as we have seen previously.

"Coffrin et al. (2014) found that there were many more students viewing the videos than working on the assignments and that there was a noticeable and consistent decline in the number of students participating in the course every week" (Hew, 2015: 325).

A list of significant tools/media that foster student participation is provided below:

a) Discussion boards, chat rooms, buzz groups[29] or Jigsaw debates.[30] More information related to these activities is provided in the next section, i) 'interaction concept' process.
b) A browser-based communication tool:

> A browser-based communication tool which allowed real-time chat with instructors or other learners on the courses. The feature to link discussion threads to related course sections was limited by the design of the platform.

[29] Buzz groups: "Set a question that has multiple answers. Students consider on their own and then discuss with a colleague" (Exley, 2013: 2).
[30] Debates: "Students are provided with different pieces of information which they have to share to fully explore the topic or solve the problem" (Exley, 2013: 2).

> It was offered in all courses on edX, FutureLearn and Open Learning […]. [Some of them had] instructors involved in the online discussion; or a team of facilitators (called "mentors", "teaching staff" or "community TAs") responsible for answering students' enquiries and responding to students' posts, in order to keep the discussion active and updated. (Wong, 2016: 113)

In my observations, I could not determine what kind of tool was used.

c) Interactive materials: Self-quizzes, assignments/tasks, computer-graded questions, interactive surveys, and peer-assessment.

d) Videos, images and audios: a set of questions are linked to these interactive tools.

This list reflects the importance of multimedia tools to keep students hooked into the MOOC. In this section, I approach the third and fourth options. The first two choices were developed in the following process i) 'interaction concept'. In addition, they were also included as activities to encourage student engagement.

In Zhu, Bonk and Sari's study (2018: 216), 20% of the instructors used two or more media elements to teach the same content.

Which media concept will be followed (e.g. interactive media)? (P) (T)

Interactive media are defined as a method of communication in which participants manage and share information. It aims to enhance the user's experience. The meaningful feature is that interactive media connects students, allowing them to be active users and to communicate with one another. Thus, there is a free circulation and exchange of information. For these reasons, interactive media is a powerful learning tool that can be used to encourage peer interaction in a MOOC. Students become more active, more collaborative and their learning process is more effective (Dhir, 2019).

h) 'Communication concept' process

Role players: Designer (R) and facilitator (X)

With reference to this topic, Wong (2016) explains that students connect with each other and their facilitators (supervisors, professors, tutors) through network sites and wikis. The author refers to several other authors such as Bremer (2012), who argues that Twitter is the favourite communication tool of students, with the course blog following it in second place. "Web-based communication enables instructors to get involved in both one-on-one and group interactions" (Wong, 2016: 110). Finally, Wong adds that DeBoer found that students who work collaboratively in their studies were on average more successful than those who worked independently (Wong, 2016: 110). These comments show us that tools and software are not only important in encouraging learning but also that, ideally, they should be similar to platforms that students already use in their free time. This would in turn facilitate high participation and an effective and engaging environment for students to exchange ideas and knowledge.

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
COMMUNICATION CONCEPTS	Which communication concept will be followed? (P) (T)	i. A welcoming lecture video by teaching staff
	Are there other strategies to encourage learners to enrol in the course, such as strategies to make the course more engaging for students? (P) (T) (S)	i. Rating by users, the number of ratings and the number of reviews of the course
		ii. View of number of students already enrolled

Figure 43. ‘Communication concept’ process.

Which communication concept will be followed? (P) (T)

i. A welcoming lecture video by teaching staff

Once the target audience has been identified, and respecting its heterogeneity, students should to be welcomed by the staff who will teach the MOOC, informing them about the topics that will be covered. A welcoming lecture video performed by instructors is an appropriate way of making students feel closer to the teaching staff, while being informed of the contents that will be developed during the course.

Is there a teaser, a short introductory advertisement in the MOOC that encourages interest to enrol in the course?

The findings were classified as follows:

(0) A welcoming video before enrolling in the course

(1) A welcoming video after enrolling in the course

Are there other strategies to encourage learners to enrol in the course, such as strategies to make the course more engaging for students? (P) (T) (S)

Other strategies aimed at encouraging learners to enrol in a MOOC:

i. **Rating by users, the number of ratings and the number of reviews of the course**

This is a marketing strategy used by platforms, aimed at appealing to students and influencing their decision to enrol in the course by telling them about the experiences of other students.

Classification of findings:

(0) There is no information about the rating by users, the number of ratings and the number of reviews of the course

(1) One or more of these data are provided: the rating by users, the number of ratings and the number of reviews of the course

ii. View of number of students already enrolled

This is another marketing strategy used by platforms to show potential learners how many students are already interested in enrolling for the course. In this study, I investigated whether it was beneficial or a deterrent that a course had many students.

Classification of findings:

(0) No information

(1) From 1–5,000 students (<5K)

(2) From 5,001–10,000 students (>5K and <10K)

(3) From 10,001–20,000 students (>10K and <20K)

(4) From 20,001–30,000 students (>20K and <30K)

(5) More than 30,000 students (>30K)

i) ‘Interaction concept’ process

Role players: Designer (R) and facilitator (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
INTERACTION CONCEPT	Which types of interaction will be used? (P) (T)	i. Are there discussion boards and chat rooms?
		ii. Collaborative learning support?
		iii. Establishing study groups?

Figure 44. ‘Interaction concept’ process.

Which types of interaction will be used? (P) (T)

"Design can greatly influence learner interaction and engagement in online learning" (Garrison & Cleveland-Innes, 2005, as quoted in Zhu, Bonk & Sari, 2018: 204). This reflection guides us to think about how important the encouragement of interaction is in a course. Increased interaction is a pedagogical challenge that instructors can address through nurturing connectivism among students and academic staff.

When I talk about participatory learning environments, I am referring to the improvement of participants' interaction in order to foster learning. Interaction with other students is significant. Thus, the presence of teaching staff is essential in order to guide and monitor discussion boards (Wong, 2016: 110) with the aim of solving problems that might arise. These might include large numbers of participants and high volumes of online resources. "Also, Rollag states that the use of discussion boards may serve as a better means to accomplish the desired learning outcomes for students who do not feel comfortable talking to their instructors face-to-face" (Wong, 2016: 110).

Why is interaction with others beneficial in the learning process? Dr Kate Exley (2013: 2), an independent higher education development consultant, believes that interaction supports learning because it helps to develop certain skills, such as 1) core and cognitive skills, like communication, teamwork, collaboration and management of one's own learning, using the ideas, concepts, and knowledge learned to be more critical and evaluate what has been learned, 2) peer learning, such as listening, debating, sharing and transmitting knowledge, and problem solving, and 3) feedback from tutors/instructors, such as adapting teaching strategies to students' needs, detecting whether they are attaining their goals.

As I mentioned in the previous section g) 'media design' process, discussion boards, chat rooms, browser-based communication tools, and interactive media are all strategies that promote interaction among students in a MOOC.

i. Are there discussion boards and chat rooms?

Platforms provide information about discussions boards and chat rooms, presenting them as a chance to begin conversations with other partners, share knowledge, and to ask and answer fellow students. This information includes conduct codes, rules and recommendations to participate, such as, be respectful to others, be constructive, or the use of titles that summarise the content of ideas that students wish to share in the chat.

> Zhu, Bonk and Sari (2018: 218) conducted a survey of instructors, which revealed that a majority of [respondent] instructors (82%) interacted with learners through the online discussion forum. Platform messages (26%), social media connections (21%), personal emails (20%), and virtual meetings (10%) were also utilized for instructor–learner interaction. No one used phone calls or texting for interaction. Sixteen instructors did not find instructor–learner interaction applicable to their MOOCs.

Despite this citation, Zhu, Bonk and Sari also observed that one of the design challenges that would have to be overcome by instructors was "promoting active participation of learners (Anders 2015, cited in Zhu, Bonk and Sari 2018:208) and encouraging participation in the discussion forums" (2018: 208).

The discussion forum is the commonest instructional strategy used by instructors to create conversation among students and make them feel engaged in the course: "(75%) [of instructors] used asynchronous discussion forums" (Zhu, Bonk & Sari, 2018: 218).

ii. Collaborative learning support

There are different types of collaborative learning support. However, in practice MOOCs do not usually offer students these interesting possibilities. In my view, the balance between the large number of students and the number of instructors would be one of the most important reasons. In order to solve this problem MOOCs should limit the number of enrolments or employ a larger number of instructors. In conclusion, they should invest more in the solid structure of the course. The idea should be to create smaller students' groups to perform collaborative learning strategies such as the following: (1) think-pair-share, (2) informal collaborative learning groups, (3) formal collaborative learning groups, (4) collaborative base groups, and (5) jigsaw collaborative learning (Bruce, 2017).

The tool to foster collaborative learning that I found most often in MOOCs, was discussion forums. Going a step further by creating smaller learning groups or employing a larger number of collaborative learning support should be more investigated. A search is required to determine whether collaborative learning, one of the newest types of learning strategies, has particular benefits for students, such as deeper and more effective learning, when it is encouraged to a greater extent among students.

iii. Establishing study groups

This tool is clearly related to the previous one. What are the ideal conditions for a study group if it is to be effective?

(1) Study groups could have two opposing effects. On the one hand, students could feel more committed and increase their participation in the MOOC. However, on the other hand, students could feel overloaded, and this could become a reason to drop out the course. These groups should involve only a small number of participants.

(2) Smaller groups would motivate students to be more prepared for the project they are developing; but there may be conflicting effects, which designers should be aware of.

(3) The challenge posed by small groups is greater than that presented by larger groups. Students should be better organised and focused on the topic. Thus, deeper and more effective learning is ensured.

(4) The sessions should be very well planned to be most effective: a) according to an instructor guide, b) answering specific questions, c) allowing students to decide how they would like to work, develop and solve the proposed project (The University of Utah, 2015).

j) 'Feedback concept' process

Role players: Designer (R) and facilitator (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
FEEDBACK CONCEPT	What type of feedbacks will be given? (P) (T)	i. Types of feedback

Figure 45. 'Feedback concept' process.

Feedback is a key tool that motivates students and makes them feel involved in the learning process. It provides them with effective experiences of teaching and learning.

Throughout the project, I argued several times that feedback should always be provided to ensure high student participation and effective learning. This was supported in the related literature. In the case of MOOCs in particular, feedback should always be provided because MOOCs have specific features: 1) large numbers of students, and 2) distance learning.

The lack of instructor presence has additional inconveniences. In Zhu, Bonk and Sari's (2018) study, they argue that the absence of feedback is a complaint shared by many learners (Clara & Barbera, 2013). They declare feeling frustrated with the lack of personalised feedback (Rice, 2013). Thus, a suitably designed discussion is a requirement to ensure the smooth running of the MOOC (Zhu, Bonk & Sari, 2018: 224).

The following studies are some examples of where literature shows that quick and effective feedback has benefits, and I believe that it is an essential tool to ensure an effective learning experience.

- A prompt instructor feedback is linked to a course focused on offering a quality experience with a high level of student's engagement, where the "Best Practices in Online Learning" were analysed (Neumann, 2013).

- In a study undertaken by Bovill, Morss and Bulley at Glasgow University (Scotland), the authors found that students' feedback was the most significant tool to foster student participation in curriculum design (2009: 3).

- Zhu, Bonk and Sari (2018: 207-208) agree saying that constant teaching support where the provision of immediate feedback to students is an essential, is a design challenge for MOOCs.

- Feedback from tutors/instructors is also used as a tool to adapt teaching strategies to the students' needs, and as a way of detecting whether they are achieving their goals (Exley, 2013: 2).

- "Continuous feedback is thus important to encourage participation in the learning community" (Wong, 2016: 111).

- Finally, one of several factors that could influence student engagement is, particularly, instructor presence (Das, 2012), instructor humour (Baker & Taylor, 2012), and availability of feedback (Sull, 2012).

What type of feedbacks will be given? (P) (T)

i. Types of feedback

According to Gaudreau Chris and Liu Weiyang (2016), feedback fosters student participation in the course, and is also key to providing a successful MOOC. In their study to identify the kind of feedback that most boosted student's engagement, they found as follows: 1) it is important to express esteem for students' work from the beginning. Students should receive a positive and appreciative comment from instructors, 2) instructors should reply to students, allowing them to know that instructors were tracking their learning process, 3) share links to resources besides course content, making students aware of new information and ideas, 4) directing questions at students to encourage them to reflect and make the learning process more effective. The aim is to broaden students' knowledge and skills, 5) to provide them with new actions to take in their work, 6) to provide them with guidelines, being gentle with suggestions, giving advice…such as "I suggest…", 7) to share experiences between instructors and students to strengthen relationships, 8) to connect students with each other, e.g. "referencing his/her opinion while providing an explanation", and 9) to encourage students constantly during their learning process.

Thus, reiterative and positive comments from instructors to students, suggestions of resources, the raising of questions, or strengthening students' relationships are some of the strategies that instructors can use in their MOOCs to boost student's engagement (Gaudreau and Liu Weiyang, 2016).

k) 'Concept for tests and assessment' process

Role players: Designer (R), facilitator (X), and provider (X)

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
CONCEPT FOR TESTS AND ASSESSMENT	What concept for tests and assessments will be followed (e.g. formative assessment, summative assessment, authentic or work-integrated assessment, diagnostic assessment, criterion-referenced assessment)? (P) (T) (S)	Formative assessment
		Summative assessment
	How are the tests and assessments rated (e.g. grade system, scoring rubric system, point-system, reviews or comments)? (P (T)	i. Test rating scales: grade system, scoring rubric system, point- system, reviews or comments
	What is the range of assessment tools used (e.g. self-tests, quizzes, peer-reviewed assessments, small group collaboration)? (P) (T)	i. Assessment methods: self-tests, quizzes, peer-reviewed assessments, small group collaborations
	How do the learners receive their results from tests and assessments? (P) (T)	How learners get the results from tests and assessments

Figure 46. 'Concept for tests and assessment' process.

Assessment is key in any training in order to determine whether students have reached the course goals planned by teachers. In line to how to be effective in teaching and learning, assessment is the most significant tool with which educators can find out whether the learning process is successful. The learner's learning process might be influenced by the setting of assessment (Sek et al., 2012).

Also, through assessments, students can gain an idea of how they have progressed throughout the course. After tutors' or instructors' feedback, students can then focus their work on improving a specific aspect, topic or issue.

What concept for tests and assessments will be followed (e.g. formative assessment, summative assessment, authentic or work-integrated assessment, diagnostic assessment, criterion-referenced assessment)? (P) (T) (S)

Zhu, Bonk and Sari (2018: 219) argue that assessment methods are challenges that concern instructors. They explain in their paper that in their study, instructors used "both formative and summative assessment" in their courses. Different types of assessment such as quizzes, assignments, tasks, computer-graded questions and peer-assessments help to identify the level of students' engagement, and whether they are likely to complete the course successfully.

How are the tests and assessments rated (e.g. grade system, scoring rubric system, point system, reviews or comments)? (P) (T)

i. **Test rating scales: grade system, scoring rubric system, point system, reviews or comments**

In Zhu, Bonk and Sari's (2018: 215) study, 42% of respondents used automated grading of multiple-choice questions to assess student learning, 14% used a sharing portal and only 11 of 134 instructors asked students to present something during the final class. There were 61 instructors who selected "other", and they mainly mentioned quizzes and peer assessment. In one of the interviews, an instructor who taught in China mentioned that "then there has to be some assessment...There are a lot of multiple-choice questions".

However, Zhu, Bonk and Sari (2018: 222) continue, observing that instructors often experience limitations because they have to use tools and functions from the learning management systems that platforms make available to them, such as auto-graded quizzes (multiple-choice, true-or-false, fill-in-the-blank, etc.). These limited means do not allow instructors to assess students' learning in other ways. "Given that it is impossible for instructors to evaluate thousands of assignments in a short period, MOOC learners are often disappointed" (Zhu, Bonk & Sari, 2018: 222). One possible alternative to assess and grade students is to use peer assessment in MOOCs. Nonetheless, the diversity of students might cause problems in this regard such as the efficiency of peer feedback, quality and equity.

> Kolowich (2013) mentioned that 34% of the instructors employed peer grading in their MOOCs, while only 26% of his respondents considered peer grading reliable. Likewise, Meek, Blakemore, and Marks (2016) also stated that people raised questions about the effectiveness of peer grading. (as quoted in Zhu, Bonk & Sari, 2018: 222)

However, in Zhu, Bonk and Sari's (2018) paper, other researchers found benefits from peer assessment, for both the giver and the receiver of the feedback. Other authors explain the importance of defining peer assessment with suitable instructions. It might be effective in evaluating learning and must thus be undertaken carefully. Finally, Zhu, Bonk and Sari (2018) add that this is a challenge that could be managed by using artificial intelligence technology to automate this (2018: 223).

What is the range of assessment tools used (e.g. self-tests, quizzes, peer-reviewed assessments, small group collaboration)? (P) (T)

i. Assessment methods: self-tests, quizzes, peer-reviewed assessments, small group collaborations

Sek et al. (2012) argue that a customisation of the setting of quizzes feature is fundamental to enabling their use in both types of assessment (formative and summative).

Instructors have different options when setting up a quiz. They can customise quizzes to meet the needs of their students. For example, for a specific quiz, instructors can set (1) the date it will be available, (2) the time it will take to complete the test, (3) assign partial credits for questions with multiple options, (4) specify the number of attempts at taking a test, (5) set the time limit, (6) and decide whether they will provide learning aids for students, and so on. The most significant of these features, is time students will have to spend to solve it.

On edX platform we find:

> **Practice quizzes**: these quizzes are intended to help consolidate the material you have just seen, and make sure you have understood the key points.
> **Graded quizzes**: these graded quizzes add points to the final grade (if you are in the verified track). You are required to complete them to complete the course.[31]

[31] Practice and graded quizzes. Retrieved from: < https://courses.edx.org/dashboard>. Last accessed April 25, 2020.

With reference to peer-review assessment, and according to the publication "Group Peer Review as an Active Learning Strategy in a Research Course" (Odom et al., 2009: 109), through peer-reviewed assignments students: 1) experience the use of upper level thinking skills, 2) work in collaboration with other partners, and 3) evaluate the work of fellows in a critical and constructive way. In this kind of activity, they have an opportunity to figure out, recognise their mistakes, and to benefit from their achievements. In conclusion, peer-reviewed assessments encourage collaborative learning and critical thinking.

The Coursera platform explains that peer-graded assignments require students to grade each other's work. They submit their work and are then asked to review their classmates' assignments. These assignments will be awarded a passing grade if the assignment has reached the required objectives and if students have reviewed their classmates' assignments. Students will then be asked to provide a score for each part of the activity. Final grades are calculated by combining the median scores they received for each section. The platform includes information about conduct codes such as being respectful, encouraging, and honest (Coursera, 2020).

Programming assignments require students to write and run a computer program to solve a problem. They include both assignment instructions and assignment parts. Instructions may include a link to a downloadable starter package that includes starter code, detailed guidelines, and other resources. Assignment parts are similar to individual quiz questions. Each part is a single coding task that can be completed one at a time (Coursera. Help articles, 2020).

How do the learners receive their results from tests and assessments? (P) (T)

Many students would appreciate it if instructors would provide a quick response in their assignments. Students would feel that they had the full support of instructors and believe that they were very involved in the MOOC, not giving students the chance to drop out the course.

1.4.1.5 Disclaimer

In the course of this study I referenced Wikipedia. I am aware that in the academic world Wikipedia is not yet considered to be a credible source. However, the topic of my dissertation also supports the idea of creation of knowledge through the Internet and its sharing among people. In my opinion, this makes Wikipedia a good example of a tool and a source that should be considered.

Wikipedia has become a site dedicated to providing credible information from credible sources. On the website there is an explanation of how they use "a variety of software-assisted systems and automated programs (to) help editors and administrators to watch for problematic edits and editors".[32] In addition, there is a so-called Arbitration Committee which "deal(s) with disputes that remain unresolved after other attempts at dispute resolution have failed". This shows the desire of the creators of this platform to become an accepted source in the academic world.

[32] Wikipedia: About. Retrieved from https://en.wikipedia.org/wiki/Wikipedia:About#Wikipedia_content_criteria. Last accessed May 21, 2019.

https://en.wikipedia.org/wiki/Wikipedia:About#Wikipedia_content_criteria

In addition to this, owing to the constantly changing internet environment, there may be some internet pages that have changed their content, updated their data, or even disappeared. I have indicated the dates on which I consulted these sources, at which point these sources appeared reliable.

1.4.2 Descriptive statistical analysis

1.4.2.1 Data collection techniques

A mixed methods design is based on pragmatism and includes most quantitative and qualitative studies (Hernández Sampieri, 2013: 551). With the aim of answering the specific objectives, the creation of an enriching and a comprehensive instrument was essential to assess the required data. This required me to reflect and justify the reason for the descriptive statistical method chosen. The use of both methods (quantitative and qualitative) provided me with an approach that was most for suitable sample to be analysed. In addition, it allowed me to reinforce the credibility of results and procedures (Hernández Sampieri, 2013: 552). Descriptive statistical analysis played a meaningful role in this research study.

Specific objectives linked to descriptive statistical analysis:

1) To analyse MOOCs in order to define design outlines.

2) To identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation.
3) To collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation.
4) To identify the factors that best encourage student engagement.

The chosen descriptive statistical method was of a central tendency type, such as the median (Kenton 2019). As there were odd numbers in the sample, the median number would better interpret the collected data (Ganti, 2019).

1.4.2.2 Data collection process

The process of data collection consisted of: (1) the transfer of data on student participation during the MOOC learning process from one source (institution), (2) through observation of MOOCs, I extracted the factors or items (previously categorised and identified) from the website to proceed with the study, and (3) finally, I evaluated the data through a statistical analysis using the median. The observation of MOOCs was performed by stepping into students' shoes to examine what they experienced when they enrolled in a MOOC. The idea was to check the design, resources, tools and proposed activities. Thus, strengths, weaknesses and proposals were identified with the assessment of each MOOC. The aim was to identify any factors or characteristics of MOOCs that made them to be interesting and appealing, and thus, encouraging student engagement. Using this approach, the analysis and discussions were conducted. These results worked as indicators that led me to a design proposal.

1.4.2.3 The sample

There was one source of data. The source provided data on students' participation in courses running from the beginning of the initiative until August 2019. The institution joined Coursera in 2012 and edX in 2013. The observation (checking and tracking) of courses took place between October 2019 and April 2020. A sample of 79 MOOCs on these two platforms was observed. Qualitative insights were generated from observation and publications, and quantitative insights from a descriptive statistical analysis.

I was able to work on each different factor in 54 courses from the sample of 79 MOOCs. The remaining courses did not have the required information. I collected data that referred to three levels of participation in MOOCs. In other words, all of them are students who enrol and take part in a MOOC in some way.

- Samplers. Users who sampled the coursework but did not complete at least 50% of the video lectures.
- Auditors. Users who did not submit at least 50% of the graded assignments but watched at least 50% of the video lectures.
- Graded. Users who submitted at least 50% of the graded assignments, and therefore provided enough evaluation pointers to be eligible to pass the course.

When students enrol in a MOOC, registered users are not given the explicit option to identify themselves as samplers, auditors, or graded (candidates who pass the course). Thus, their motivation needs to be inferred from their activity during the course. For this reason, institutions that offer MOOCs classify students depending on their level of participation.

The source explained that MOOC grades were calculated, based on all weekly assignments, rather than on a final exam. Data from Coursera and edX were obtained from the source.

1.4.2.4 Data analysis process

After collecting quantitative data through the observation of MOOCs on the website, and classifying them according to defined factors, this precise classification of the extracted aspects helped me to address the following specific objectives: (1) analyse MOOCs in order to define design outlines, (2) identify and define which processes and procedures are the most suitable in the design phase of MOOCs to encourage student participation, (3) collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation and (4) identify the factors that best encourage student engagement. Considering that I worked within the QRF, I want to highlight that at the beginning of the document one can read that 'The Quality Reference Framework' can be used to analyse the needs and demands of launching a MOOC. In other words, this can be used to design, develop and implement new MOOCs and to evaluate and improve existing MOOCs.

The categorised variables assisted in the identification of factors that MOOCs use to enhance student engagement rates, and to know more about learner's motivation. Thus, the study analysed the collected data on the needs of learners, which are the key to understanding why students remain engaged in a MOOC. The following questions were then posed:

What activities might instructors develop to encourage student's engagement?

Which tools are best to ensure a high rate of participation?

1.4.2.4.1 $CAT_{50\%}$ index in the quantitative analysis

The $CAT_{50\%}$ is an index that measures the completion of more than 50% of assigned tasks. This was created to help academic staff to identify the level of student engagement in a particular MOOC. This allows us to compare the number of students who have completed more than 50% of assigned tasks to the total number of students who registered for the MOOC.

How is $CAT_{50\%}$ calculated?

$$CAT_{50\%} = \frac{\text{graded}}{(\text{samplers} + \text{auditors} + \text{graded})}$$

- At the top of the mathematical function, one can be seen the number of graded students: users who submitted at least 50% of the graded assignments, and therefore provided enough evaluation pointers to be eligible for passing the course.
- Below, the addition of the three categories in which students may be, based on their activity in the course (samplers, auditors, and graded).

Why is the $CAT_{50\%}$ index calculated for these three roles (samplers, auditors and graded)? Why did I not use the number of registrations?

The reply is as follows: the concept of registration includes a further role, visitors. Visitors are students who have enrolled in the MOOC but have not done anything relevant. Thus, these are not considered students of the course. Using this approach, I calculated the $CAT_{50\%}$ of each course of the sample.

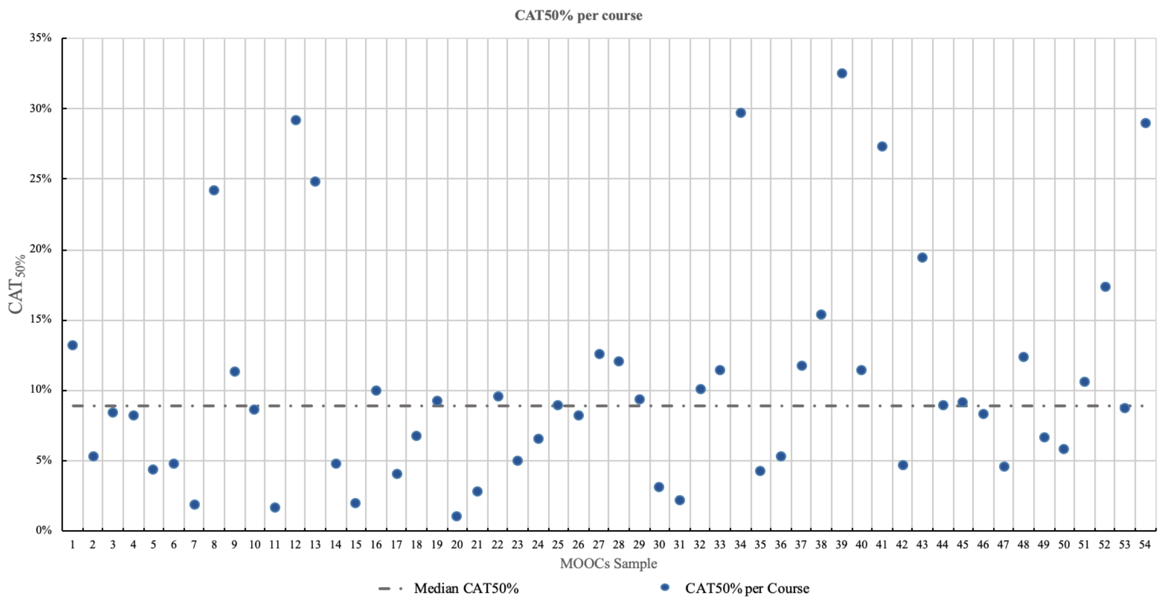


Figure 47. $CAT_{50\%}$ of MOOCs sample for each course and $CAT_{50\%}$ median of all of courses.

I used the $CAT_{50\%}$ as a benchmark to identify those factors offered by platforms that were most likely to boost student engagement. I calculated the value of the $CAT_{50\%}$ for each course in my sample, as can be seen in the previous graph.

In the following bar chart, the sample of data shows that the subject of the study was an asymmetrical distribution.

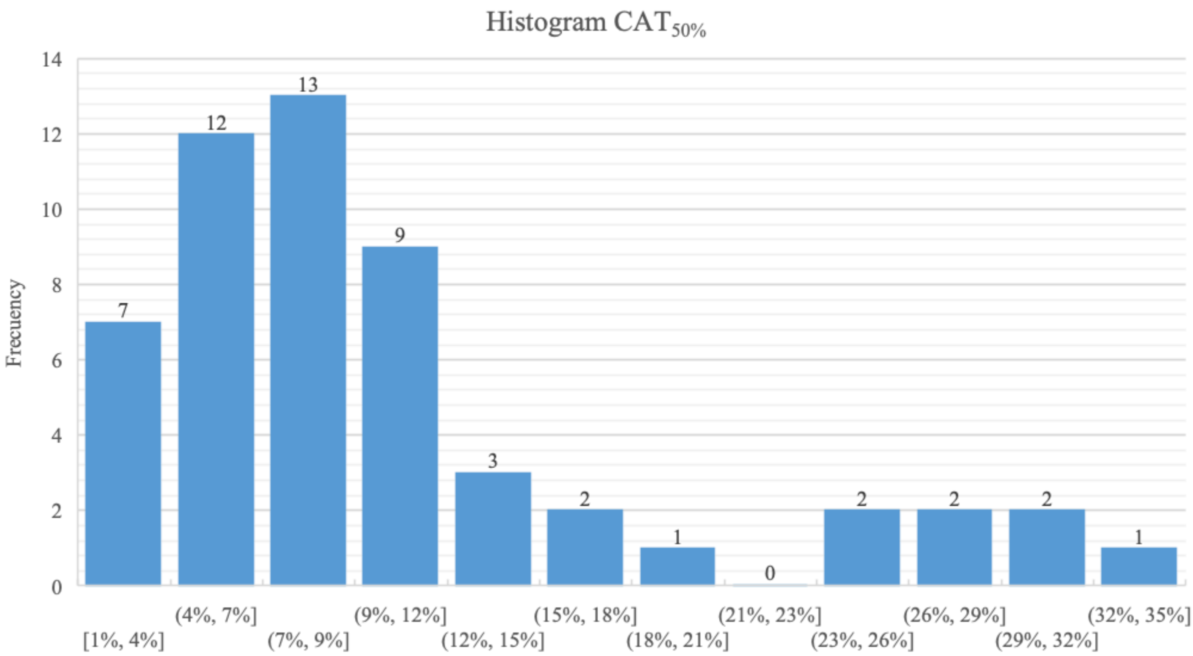


Figure 48. Bar chart of $CAT_{50\%}$ index outcomes of MOOCs sample.

Why did I use the median?

When there are very atypical figures in the sample, as in my case, the median will better explain the central point of the distribution than the mean. The latter has the defect of deviating towards extreme figures. Thus, the more extreme the figures are, the more deviated the mean is.[33]

[33] Median. Retrieved from <https://en.wikipedia.org/wiki/Median>. Last accessed January 24, 2021.

When data do not meet to a normal distribution, the median is the most appropriate way to assess the data sample because the median is more robust or sturdier than mean. In other words, the median is less affected by the presence of atypical or extreme numbers (such as in my data sample), also called statistical outliers in the distribution. Thus, the median is more representative of my sample's reality (Ganti, 2019).

The "Median" is the middle value that lies in the 50% of a set of ordered numbers. "This is the value separating the higher half from the lower half of a data sample, a population, or a probability distribution"[34]. The first quartile, denoted by Q1, lies in the 25%, and the third quartile, denoted by Q3, lies in the 75% of the numbers in the data set[35].

In the following box plot one can see how the set of $CAT_{50\%}$ of the sample is distributed. The median of my data sample is 8,84%, $Q_1 =$ 4,82% and Q_3= 12,18%. The upper whisker is longer than the lower whisker. Thus, data are skewed to the right positively.
(Σπηλιωτόπουλος: 2019).

This box plot provided information about the shape of my data set.

[34] Median. Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Median. Last accessed March 20, 2021.
[35] First Quartile and third quartile. Retrieved from http://web.mnstate.edu/peil/MDEV102/U4/S36/S363.html. Last accessed March 20, 2021.

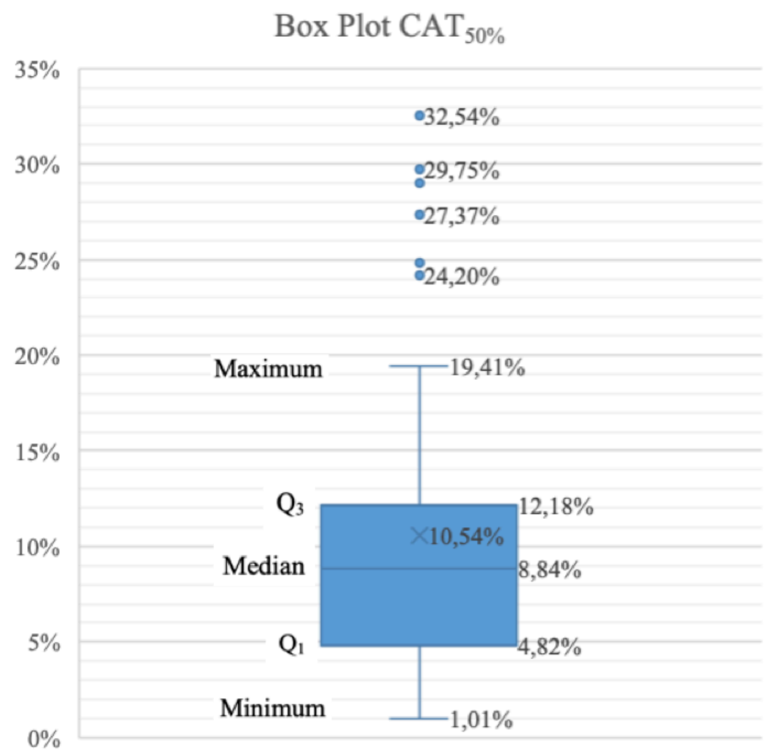


Figure 49. $CAT_{50\%}$ index (completion of more than 50% of assigned tasks).

Using this approach, I focused on the $CAT_{50\%}$ index and how I was going to use it as a tool to identify the factors of MOOCs that work best in terms of student engagement.

How was the comparison made?

Using the framework of the QRF and after disaggregating and identifying the factors that were involved in the design phase, I extracted information about MOOCs from observations and complemented it with information from publications, previous studies and the two platforms, edX and Coursera.

Each time I worked on a factor, the $CAT_{50\%}$ index for each course was used. Courses were classified according to the variables in each factor that a MOOC might have. The best values of $CAT_{50\%}$ within each factor were identified for each MOOC, choosing from the identified variables. This provided me with information about which variables worked better. In other words, which variable or characteristic was the most likely to facilitate student participation. Visual diagrams and graphs helped me to identify them.

a) A box plot

For instance, the following box plot presents the 'prerequisite' factor. The graph shows whether there were any prior conditions that students had to fulfil in order to register for the course, and then pass it.

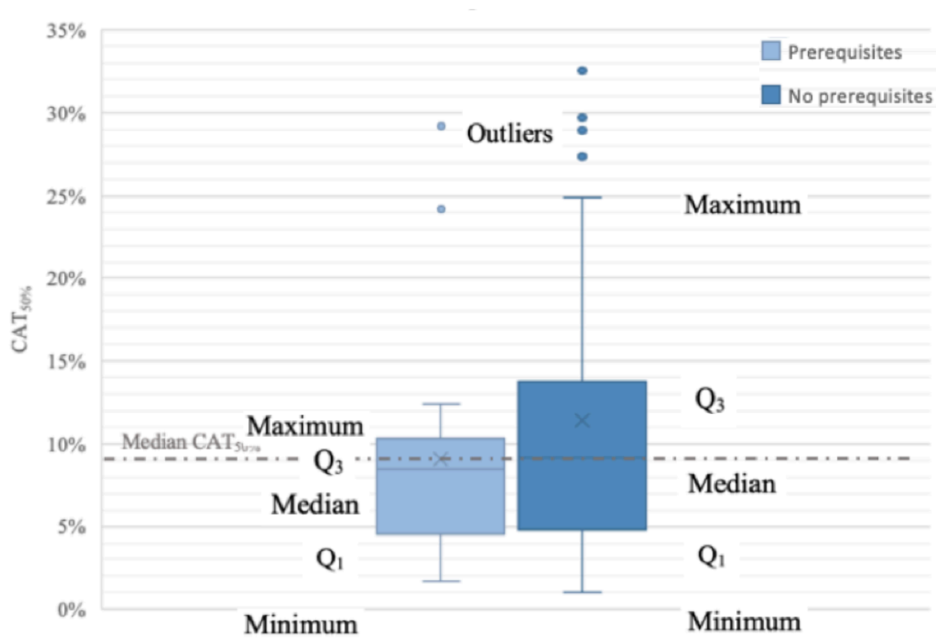


Figure 50. Box plot of 'prerequisite' factors.

In the graph, the two plotted independent variables are represented by the two boxes. The distribution of data based on a five-number summary ('minimum', Q_1 (first quartile), median, Q_3 (third quartile), and 'maximum') is displayed in each boxplot. The outliers are also indicated. A boxplot is a graph that shows the shape of data distribution, its central value, and its variability.

b) A plot one variable

In this graph, an example of the 'target audience' factor is drawn by plotting points. The graph indicates the type of audience addressed by the MOOCs.

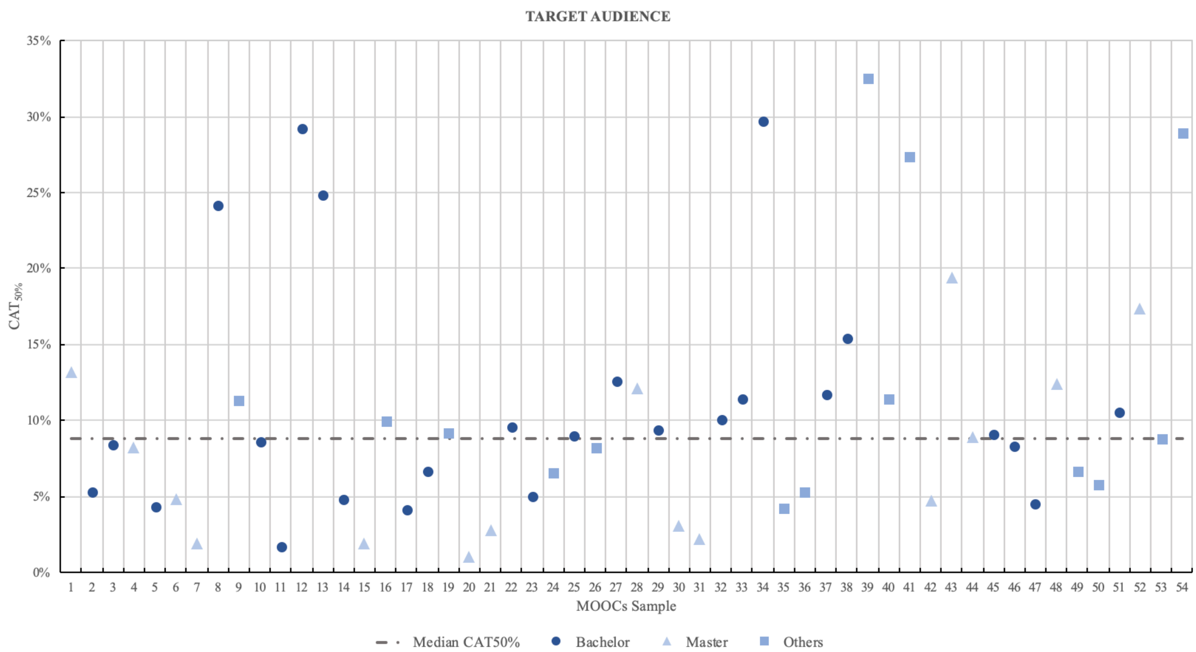


Figure 51. Distribution of $CAT_{50\%}$ per MOOC classified by 'target audience' factor.

The x axis (abscissa) indicates the list of 54 courses in my sample.

The y axis (ordinate) shows the data dispersion presented by plotting dots and classified by independent variables. In this example, the identified independent variables in the graph are: i) Bachelor, ii) Master, and iii) other. All these are the general $CAT_{50\%}$ shown for each MOOC. In addition, the median $CAT_{50\%}$ of all of MOOCs is plotted with a grey line.

$CAT_{50\%}$ is an index of student engagement that shows who performed more than 50% of the assigned tasks in a MOOC. In other words, $CAT_{50\%}$ is the rate that measures high student participation in a MOOC. Thus, with reference to this sample, those variables depicted in the above graph that are close to or above the 'median $CAT_{50\%}$ of all of MOOCs'; this means that the MOOC has a meaningful student participation.

The aim of $CAT_{50\%}$. After a descriptive statistical analysis, $CAT_{50\%}$ should help academic staff to redesign or adapt certain characteristics of MOOCs in order to achieve a higher $CAT_{50\%}$ index in next run. In other words, to enhance student participation rates.

1.5 Data triangulation strategies

Data triangulation[36] was used as a strategy in this research study to ensure the veracity of data and conclusions. The fact that I chose a mixed methodology allowed me to undertake sequential triangulation and to obtain a wide range of specifications of the MOOC design

[36] Triangulation. Wikipedia: <https://en.wikipedia.org/wiki/Triangulation_(social_science)>. Last accessed December 6, 2020.

process. Data triangulation entails the observation of whether the results are in agreement with or divergent from previous studies, approaches or strategies. One can also observe the agreement or divergence of sources, methodologies, and information collection techniques. Throughout this research, document analysis and the opinion and perspectives of thesis supervisors allowed me to verify the theoretical framework for the enquiry, the results and findings.

1.6 Limitations

During the process of completing a doctoral study, various difficulties may be encountered. In my case, and owing to the newness of MOOCs, I experienced some limitations. These limitations were related to the collection of the data, which led me to change my strategy. As a consequence, I was not able to investigate the section on MOOCs co-designs more analytically.

Institutions work within the framework of regulation data confidentiality, and they are very reluctant to provide data about teaching staff, and about students in particular. When I chose a mix of methodologies, qualitative and quantitative, I first developed a survey to submit to instructors. However, institutions reminded me of the importance of a data confidentiality agreement to ensure the privacy of instructors' and students' data.

Therefore, because of the constraints placed on data provision, I had to use more suitable methodological approaches so that institutions would feel confident about my research and provide me with data on student participation in MOOCs.

SECTION III. RESULTS

Chapter 1. Analysis of factors. A quantitative and qualitative perspective

In this section, I provide the results of the assessment. In some cases, a statistical analysis was carried out. In other cases, the collection of different studies and publications helped me to determine which factors worked best. Throughout the empirical observation, also known as fieldwork, developed below, findings can be found categorised by factors.

1.1 MOOCs co-design

Finding good practices in MOOCs co-design proved very complicated. This concerned an innovative methodology in an area that is still in the early stages of development. Despite this, two practices are presented below with the goal of throwing more light on this controversial topic among instructors. The fact of empowering students during the MOOC design phase is seen by some, as a resource for teaching staff, but as a threat by others.

Good practice 1. This practice was undertaken by the Centre for Global Higher Education (CGHE). This is an international research centre attached to higher education that aims to report and enhance higher education policy and practice. Under the auspices of this research centre, Kennedy and Laurillard (in CGHE, 2019a) conducted an innovative study in which co-design of MOOCs was analysed to determine the impact on student engagement. The chosen MOOC was 'Community Based Research: Getting Started'. This was a course using a blended-learning[37] approach. More information about this MOOC can be found on:

[37] Blended learning. Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Blended_learning. Last accessed March 23, 2021.

<https://www.futurelearn.com/courses/community-based-research/1>. Last accessed October 18, 2020.

These researchers found that a MOOC's success cannot be compared to official degrees such as masters with academic fees because of the uniqueness of MOOCs. Characteristics such as the following are present: 1) large numbers of enrolled students, 2) atypical participants (they may be graduates or professionals), 3) unusual motivations and patterns of participation, and 4) course completion is not as important as the learning experience itself (Kennedy & Laurillard, 2019b: 2).

I found a list of MOOC factors that should be evaluated to identify whether a MOOC has been successful (Kennedy & Laurillard, 2019b: 8). These factors are: video viewing time, engagement in quizzes/tests and polls, clicks to complete steps, posts to discussions, participation in peer reviews, purchase of upgrades/certificates, dates/times of engagement. In this regard, researchers put forward that the success of a MOOC can be measured by tracking the number of visited and completed steps during the course.

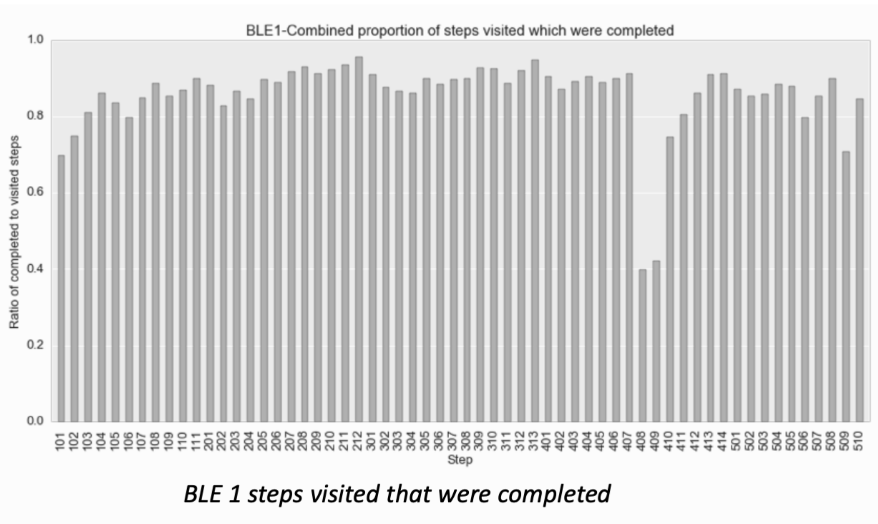


Figure 52. How should the success of a MOOC be evaluated? (Kennedy & Laurillard, 2019b: 8).

During the MOOC creation process, Kennedy and Laurillard (2019b: 3-5) point out that co-design workshops were performed with stakeholders and community members. In addition, video interviews with community members, who shared their experience, expertise and solutions with participants in the MOOC were filmed.

For the purpose of demonstrating that the analysed MOOC had a high level of engagement and the presence of co-creation during the MOOC design was a reality, researchers from the CGHE advanced arguments based on the benefits of MOOC co-design. They describe value creation cycles, as described below, mentioning the measures of value creation for each cycle: level of participation, level of activity, level of engagement, quality of interactions, and value of participation (Kennedy & Laurillard, 2019b: 10-11).

These measures are described in more detail below:

1. Level of participation (attendance of meetings, number and characteristics of active participants, people who subscribe to a site, logs and website statistics, participant lists on teleconference systems).
2. Level of activity (frequency of meetings, number of queries, quantity and timeliness of responses).
3. Level of engagement (intensity of discussions, challenges of assumptions, length of threads).
4. Quality of interactions (bringing experience of practice into the learning space, e.g. "I have a problem with this design" or "we did this in such a case").
5. Value of participation (feedback form, people coming back to community or reengaging with the network, evidence of fun, such as laughter).

Below is a description of value creation cycles:

1. Cycle 1. The creation of immediate value in activities and interactions through networking, community activities and interactions.
2. Cycle 2. The creation of potential value such as knowledge capital. Regarding this topic, Kennedy and Laurillard (2019b: 10) state that relationships and resources result in the assimilation of new abilities to learn.
3. Cycle 3. Applied value as changes in practice occur through the use of new and external tools (e.g. Padlet) and practices, and the implementation of advice and insights.
4. Cycle 4. Performed value such as an enhancement of performance through reflection about the achievements from coworking with stakeholders. For instance, a programme area Lead in a further education (FE) college (a participant in the study) observed that staff at her own college used tools learned in the MOOC in their teaching.
5. Cycle 5. Reflection for reframing value, in other words, redefining success, where new metrics of new definitions of success are proposed.

Considering all these previous items, the results were as follows: there was a high level of interactions, 56%, by the VET sector[38] and 60% by teachers. Furthermore, over 40,000 comments were posted by students:

[38] Vocational Education and Training (VET) is a term used internationally to describe education and training arrangements designed to prepare people for work or to improve the knowledge and skills of people already working. Retrieved from <http://www.rogerclarke.com/AEShareNet/backgroundInformation/007vetsector.asp.html>. Last accessed November 29, 2020.

> I think that was quite striking I think the fact that it was a MOOC and it was open ... those conversations flowed and people didn't seem to be worried about putting up their comments ... whatever they were saying they didn't mind ... they didn't mind sharing (Participant 18)
> (Kennedy & Laurillard, 2019b: 13).

In addition, post-course survey responses showed that 97% of blended learning approaches improve learning, 88% of participants were thrilled with blended learning approaches, 82% of respondents felt this would work in their context. Despite this, 55% of participants were concerned that changing their practice was too time consuming.

To bring this case study to a close, I have attempted to put forward the arguments in favour of co-design in relation to the positive impact on student participation.

Good practice 2. This second study was carried out at the university of Adelaide in the course 'Shakespeare Matters' run by edX. More information about the course can be found on <https://www.edx.org/course/shakespeare-matters>. Last accessed October 29, 2020.

During the MOOC creation process, students represented were at undergraduate, postgraduate and PhD levels of study, were contributors not only to the course design but also to content creation. Four students co-worked with the learning designer, who took note of students' reflections with the intention of improving the learning experience (Ogilvie, 2017).

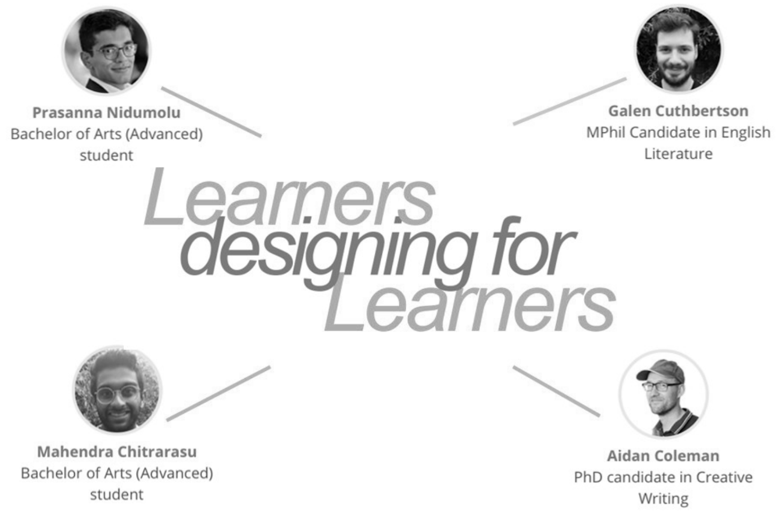


Figure 53. Learners as co-designers (Ogilvie, 2017).

Learners were included both in the content creation process and in the technical scoping of interactive assets. In the latter part of creation, students worked together with a UX[39] (user experience) designer. Their involvement was so meaningful in the course delivery that learners took part even in the course promotion video, making all of them to feel part of the course team.

As a result of this experience, the concept of co-creation from an early stage where students are included as part of a course team, an iterative design process and formative processes, had the following results:

1) More enriching learning experiences that guided academic staff in identifying what works better and what engages more students.

[39] User experience (UX or UE) is a person's emotions and attitudes about using a particular product, system or service. It includes the practical, experiential, affective, meaningful, and valuable aspects of human–computer interaction and product ownership. Retrieved from: <https://en.wikipedia.org/wiki/User_experience>. Last accessed October 19, 2020.

2) New perspectives from current students to provide us with valuable and enlightening feedback. This new viewpoint influenced and changed instructor's teaching method[40], not only in this MOOC, but also in other undergraduate courses that she led.
3) Students highlighted their sense of employability and empowerment as participants in a course team where they felt that their contribution was useful to the MOOC project.
4) The advantages of a cross-generational working method allowed participants to benefit from tech savvy input,[41] which may be a meaningful added value in the creation of a MOOC.
5) Contents developed after co-working by academic staff and students was rich, diverse, interesting and appealing.

However, instructors also mentioned drawbacks. They explained that the process was more challenging than they had expected and this implied more work, although the bulk of the work was mentoring rather than teaching.

[40] Teaching methods. Retrieved from https://teach.com/what/teachers-know/teaching-methods/. Last accessed April 13, 2021.
[41] Tech-savvy: Knowing a lot about technology, especially computers. Retrieved from Wikipedia: https://dictionary.cambridge.org/es/diccionario/ingles/tech-savvy. Last accessed November 30, 2020.

1.2 Active student participation during the course

a) 'Learning objectives' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
LEARNING OBJECTIVES	How are the learning objectives defined (e.g. knowledge, skills, competences, topic-driven, content-driven, target-group-driven, task-driven)? (P)	i. The target audience of the MOOC
		ii. Prerequisites
		iii. Main aim of the course
		iv. Main objectives of the course
		v. Design of Learning objectives
		vi. Other ways of determining the learning objectives – What you will learn
		vii. Skills you will gain
		viii. Course handouts
	Which entry-levels are the learning objectives addressing (e.g. beginners, intermediate, advanced, novice, experts)? (P)	i. Level of the course: introductory, intermediate, advanced
	How are the learning objectives assessed (e.g. formative assessment, weekly quizzes, multiple choice tests, delivery of a product, essay, final exam)? (P) (S)	i. Evaluation of learning objectives: through weekly quizzes, multiple choice tests, final exam.

Figure 54. 'Learning objectives' process.

How are the learning objectives defined (e.g. knowledge, skills, competences, topic-driven, content-driven, target-group-driven, task-driven)? (P)

i. The target audience of the MOOC

Based on the findings of the variables mentioned in section II, the type of target audience a MOOC is targeted at is as follows:

(0) Bachelor. The MOOC is focused on an audience with knowledge at the level of a bachelor's degree.

(1) Master. The MOOC is addressed to an audience with knowledge at the level of a master's degree.

(2) Others:

- Hors programme: "In French, this can be used in an educational context (extra courses or classes on top of the regular curriculum) or in a musical one (extra piece added to the regular programme for a given evening/concert/performance)."[42]
- Propaedeutics: "Preparatory study or instruction".[43] It is a "preparatory education" for an introductory course into an art or science.
- None.

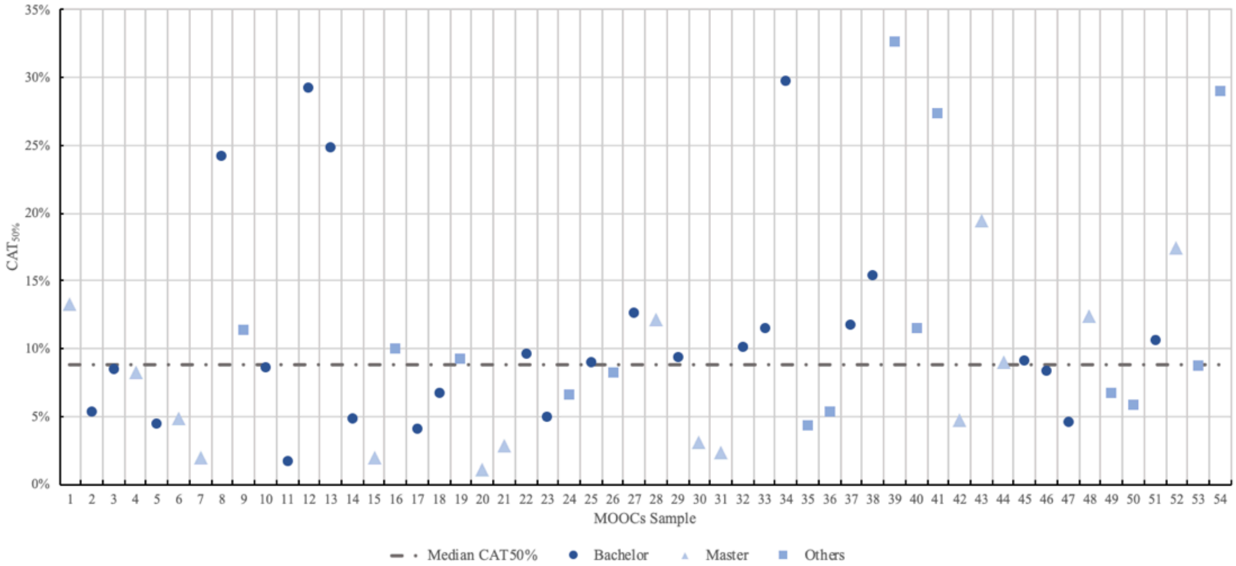


Figure 55. Distribution of $CAT_{50\%}$ per MOOC classified by 'target audience' factor.

[42] Hors programme. Retrieved from: <https://forum.wordreference.com/threads/french-expression-hors-programme.67699/> Last updated February 8, 2020.
[43] Propedeutic. Retrieved from: < https://en.wikipedia.org/wiki/Propaedeutics>. Last updated March 23, 2020.

At a glance, in spite of the presence of outliers in the sample, in the case of the ‘target audience’ factor data suggest that this factor worked best when MOOCs were addressed to an audience at bachelor’s level.

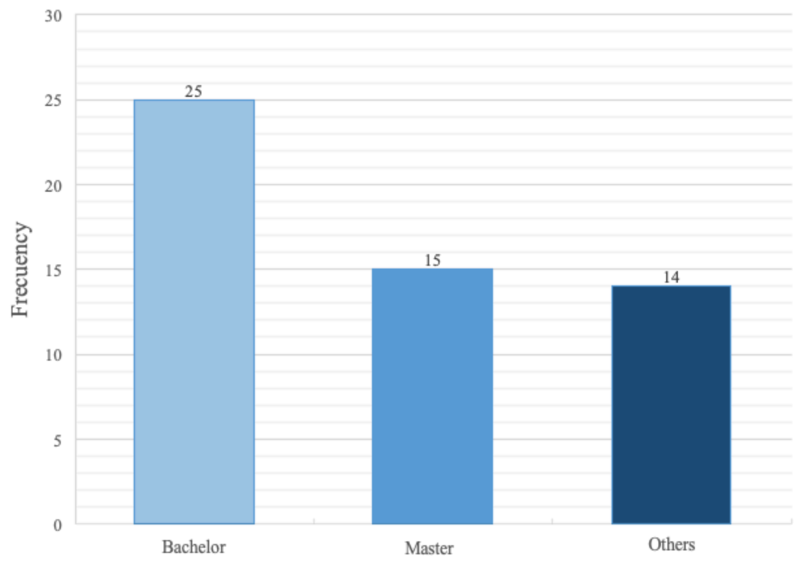


Figure 56. Bar chart of MOOCs classified by ‘target audience’ factor.

In this first factor to be analysed, each one of the above-mentioned variables (bachelor, master and others) had a significant number of equivalent outcomes to assess.

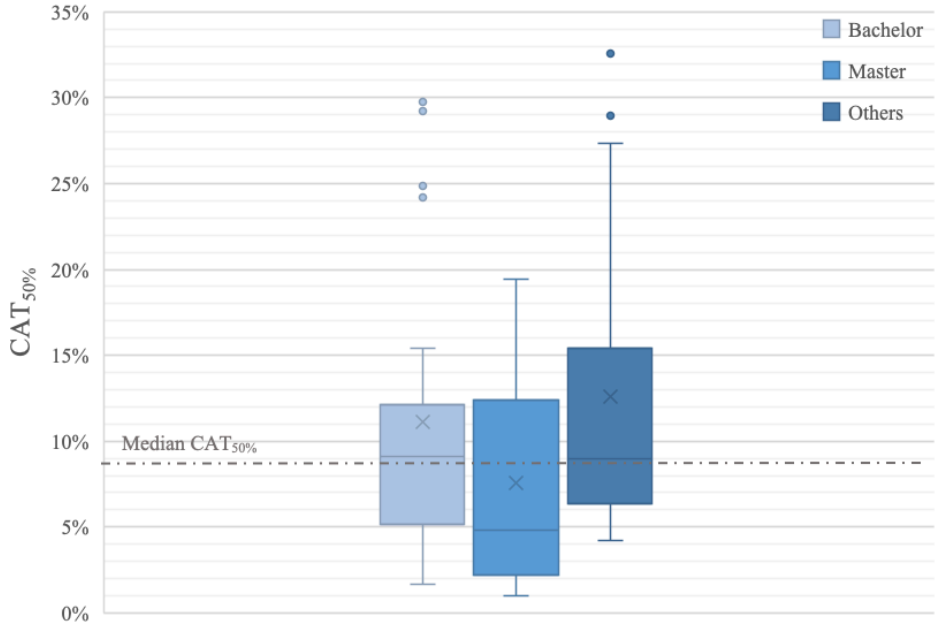


Figure 57. Box plot of 'target audience' factor.

Data from 'target audience' factor in my sample were plotted on the graph. This presented an asymmetrical distribution of two variables: 'Master' and 'Others'. This asymmetry suggests that data were more reliable in the 'Bachelor' variable than in 'Master' and 'Others'. Despite the fact that some outliers were found, they were not so significant as to be considered.

When a MOOC was aimed at the 'Master' target audience, student engagement was lower than for the other two choices. Instead, when a MOOC was addressed to a 'Bachelor' or to a specific target audience, the graph reflects that better outcomes for student participation were attained, as the median was higher than for the 'Master' group. In conclusion, student engagement was higher when a MOOC was aimed at a 'Bachelor' level and at a 'specific target audience'.

ii. Prerequisites

Have MOOCs defined prerequisites as a prior condition to access the course? These can be focused on qualifications, requirements or qualities that students should have to enrol in a MOOC. In this way, academic staff ensure that they can teach a specific level of knowledge, according to the course.

With reference to the previous classification of findings on the 'prerequisites' factor in section II:

(1) Yes, the MOOC has added prerequisites to access the MOOC.

(2) No, there are not any prerequisites to access.

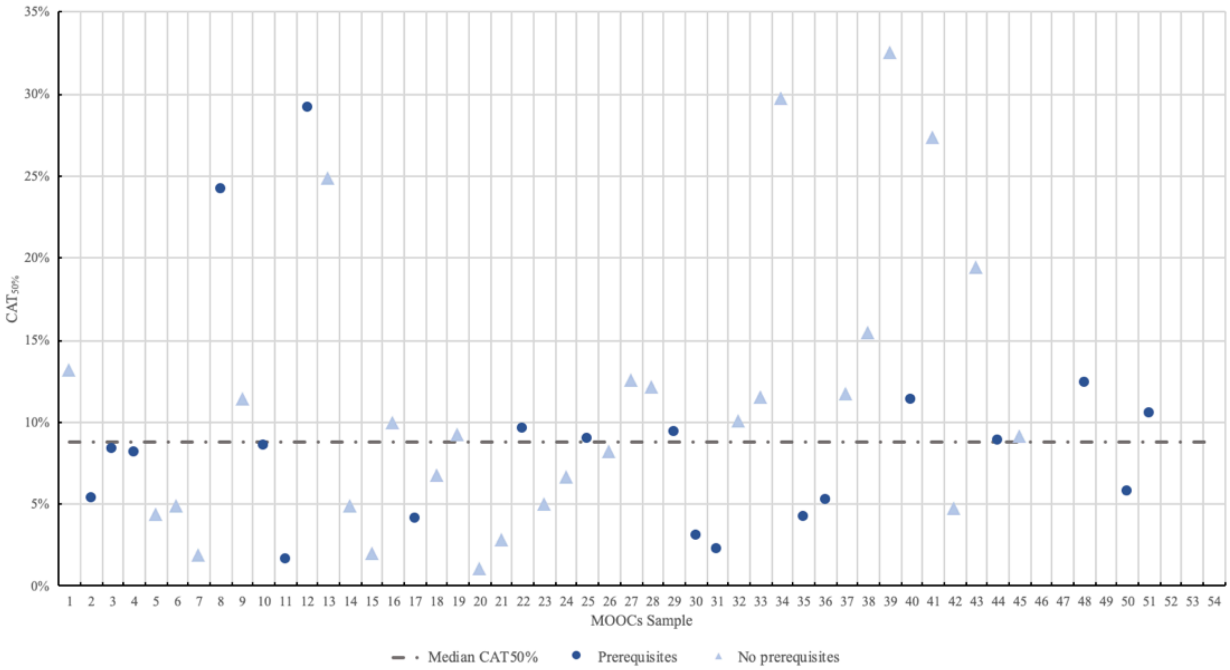


Figure 58. Distribution of $CAT_{50\%}$ per MOOC classified by 'prerequisites' factor.

The graph suggests that MOOCs in which there are no prerequisites have higher rates of student participation.

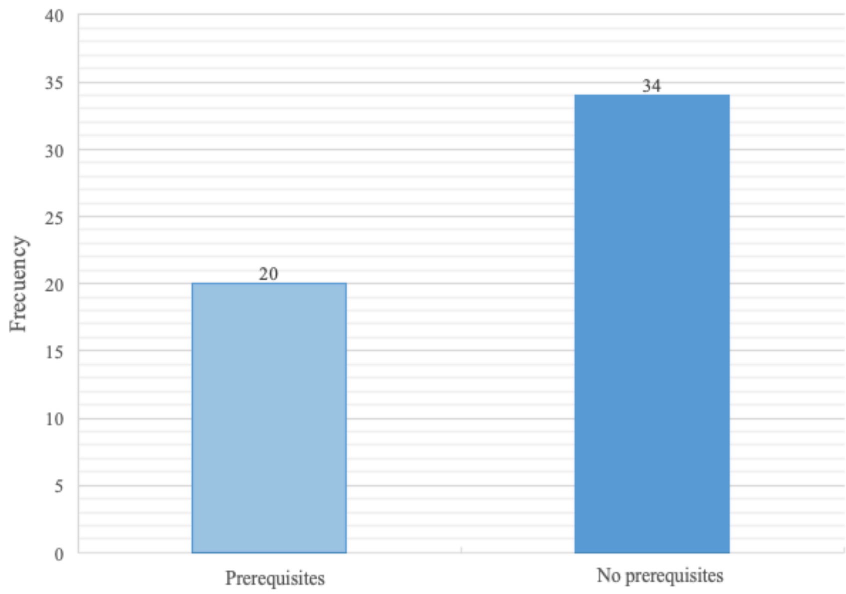


Figure 59. Bar chart of MOOCs number classified by ‘prerequisites’ factor.

Both variables (prerequisites and no prerequisites) had a meaningful number of outcomes. Thus, this suggested the reliability of the assessment developed below.

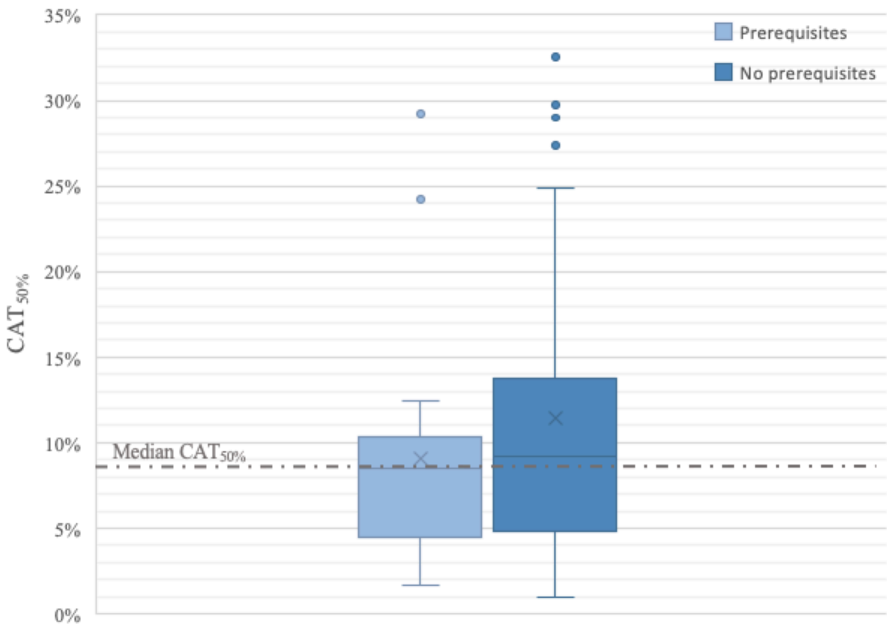


Figure 60. Box plot of ‘prerequisites’ factor.

This graph indicates that the definition of prerequisites is not a decisive factor in ensuring a high rate of student participation. The differences between the two variables are not meaningful.

iii. Main aim of the course

The main aim of the course is the statement/statements that describe the most meaningful intentions that students should achieve when they complete the course. There are several ways of defining the main aim of a MOOC. The following are the identified variables. Unlike the first finding (0) defined below, in the second option (1), the academic staff considered the main aim of the course to be a meaningful factor. Does this have an impact on student engagement?

Classification of findings:

(0) About this course: A mere enumeration of the topics by academic staff. These include general information on the basic principles of the course with a basic explanation.

(1) About this course: More accurate explanation of course contents by academic staff. An overview of all the topics, but this time course aims are described more concisely with their overarching intentions, which are focused on achieving the results of the course.

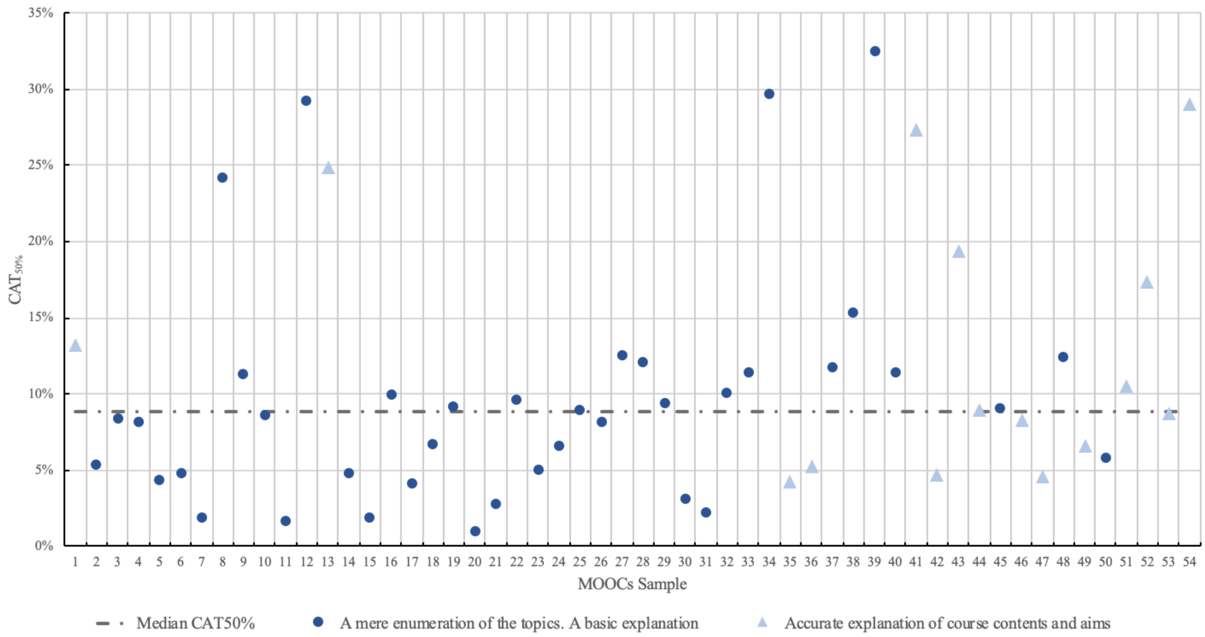


Figure 61. Distribution of $CAT_{50\%}$ per MOOC classified by 'main aim course' factor.

As demonstrated in the graph, the existence of a basic explanation of the main course aims appeared to be the commonest option in the sample of 54 courses. In fact, in 72% of courses instructors did not consider this factor as meaningful or considered by students.

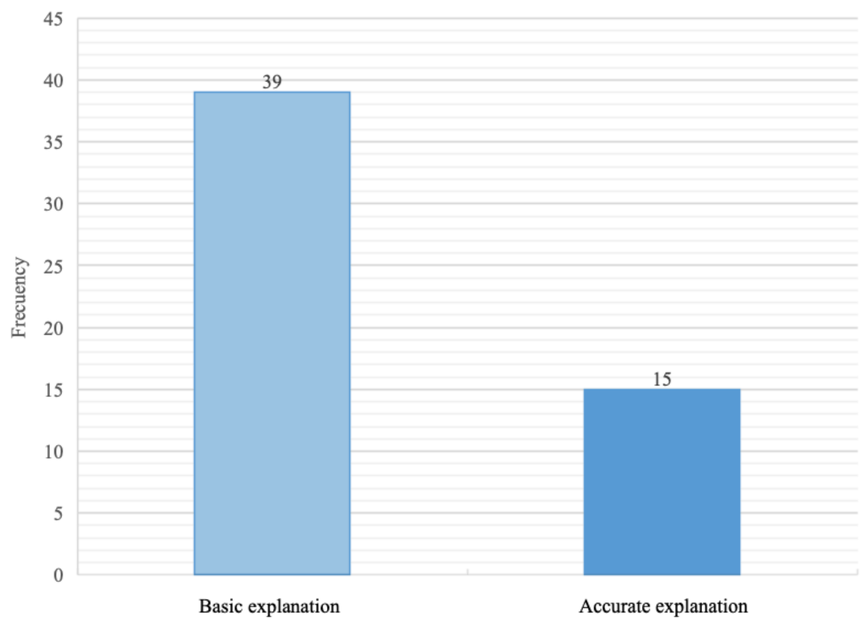


Figure 62. Bar chart of MOOCs classified by 'main aim' factor.

In the sample of MOOCs under observation, nearly 75% of instructors considered that a basic explanation of the main course aims was enough to describe a MOOC. The following graph indicates whether the main course aims should be taken into account by instructors during the MOOC design process. Are the main course aims significant for students and do they have a direct impact on student participation?

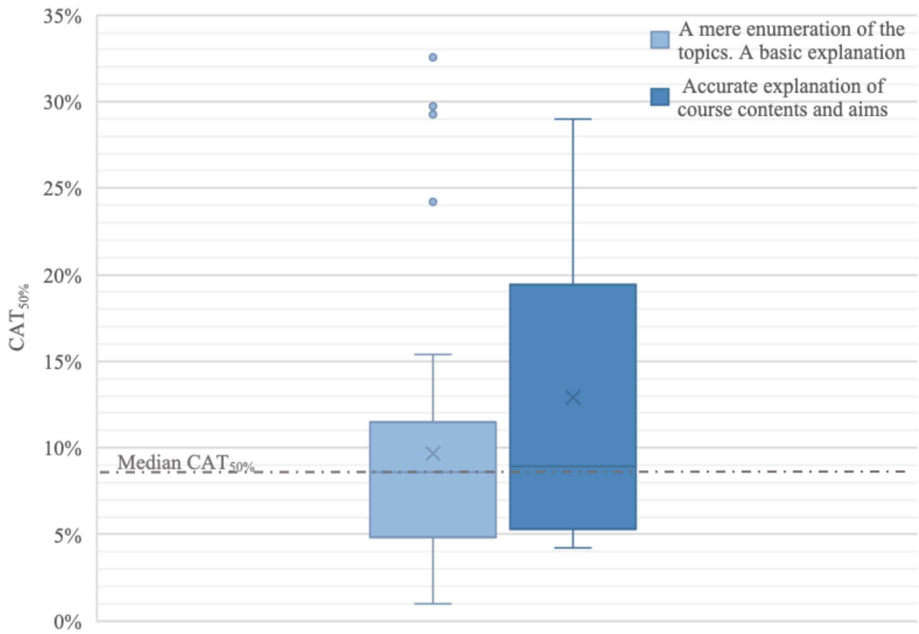


Figure 63. Box plot of ‘main aim’ factor.

Although the median is the same in both variables (basic and accurate explanation), student participation is higher in MOOCs with the second variable. Thus, one could say that an accurate definition of the main course aims performed by instructors was a decisive factor for students. Therefore, more input by instructors on this factor during the design phase could encourage student engagement.

iv. Main objectives of the course. A quick overview of all the topics that will be developed during the course

In this section students find the syllabus of the course. As mentioned in section II, learning outcomes are the required statements that constitute a syllabus, where students find the topics that will be dealt with in the MOOC.

These were the choices identified during the observation of MOOCs. Classification of findings:

(0) No syllabus is displayed to students in the MOOC.

(1) Syllabus. A simple description. Just a list of topics. Not organised by weeks. A simple enumeration of the topics or a list of topics organised by weeks, but very simple.

(2) Syllabus, defined by weeks, type of activity and time before enrolling in the MOOC.

(3) Syllabus, displayed a list of chapters or topics.

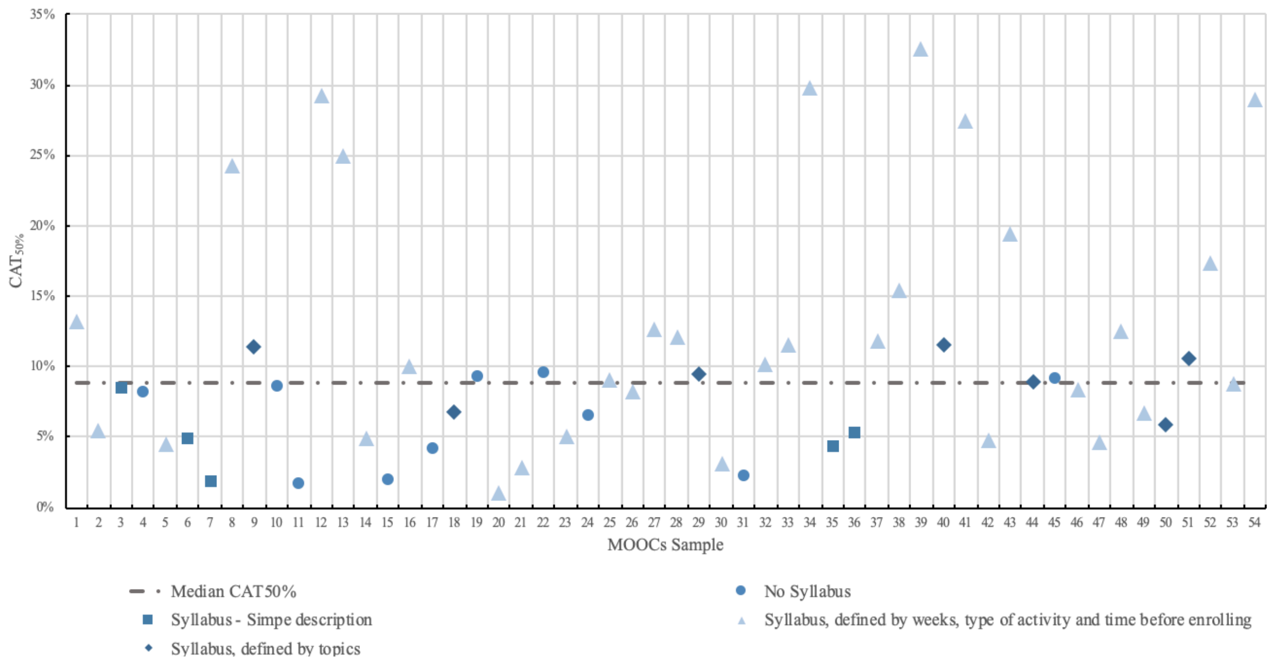


Figure 64. Distribution of $CAT_{50\%}$ per MOOC classified by 'main objectives' factor.

The graph shows that the preferred choice of instructors was to define and to plan the main objectives in the syllabus by weeks (2). Within this option, students could find the type of activity they would have to undertake and how much time they would need invest in completing the assignments set in the MOOC.

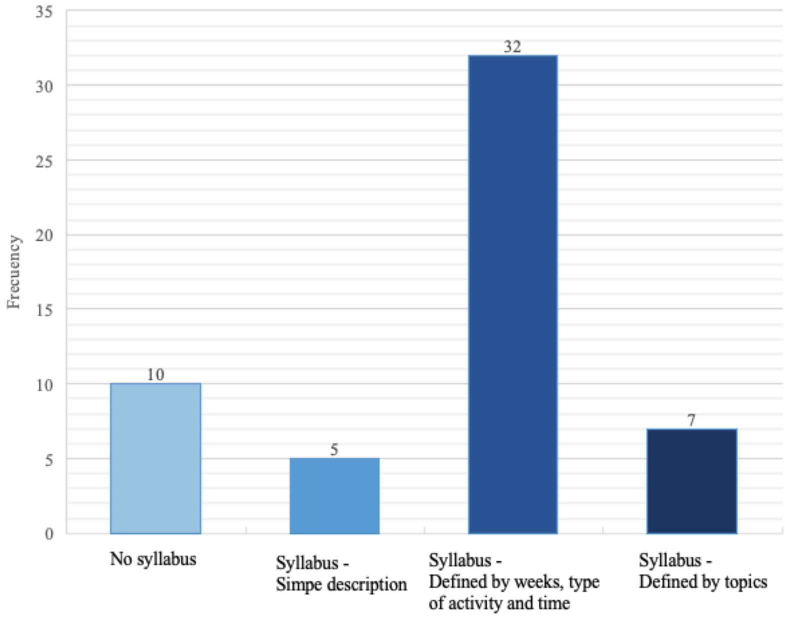


Figure 65. Bar chart of number of MOOCs number classified by 'main objectives' factor.

Here we can see that most of the delivered courses (60%) were planned by weeks. This was the strategy most used by instructors. The benefits of sharing the curriculum in this way are as follows: (a) an enhancement of students' confidence. Having good control over the work students are going to have to do, can prevent them from feeling overloaded with work, and (b) avoids 'dead' time. MOOCs must make students feel that they will not lose any time planning their work. Systematic planning is already provided in the MOOC. This is a must for MOOCs.

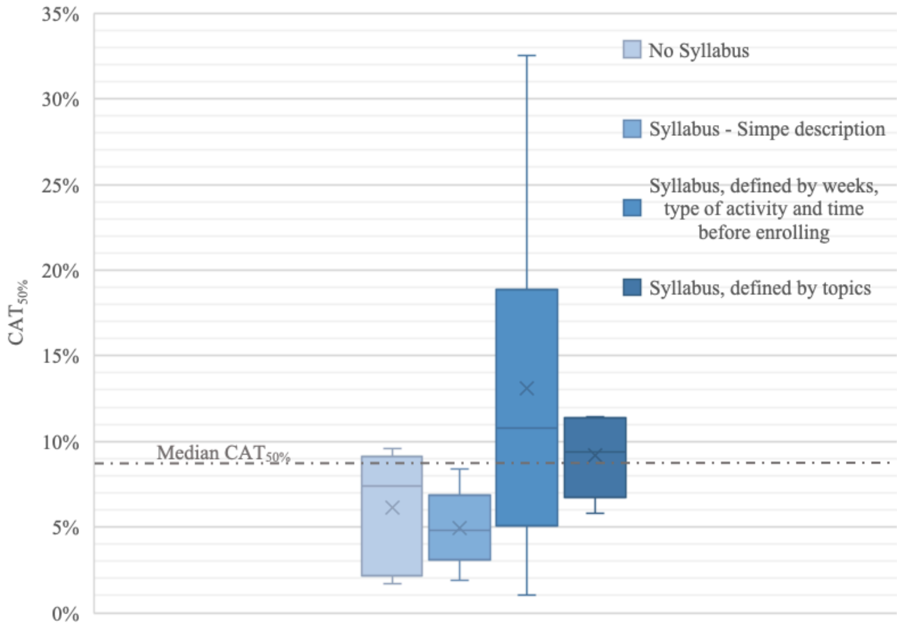


Figure 66. Box plot of 'main objectives' factor.

The graph indicates that the contents of the MOOC when planned by week and type of activity (2); this is a meaningful factor that boosts student engagement. The fact that the third variable represented 50% of the sample meant that data were reliable. Thus, it was inferred from the graph that while planning per topic (3) also works, it is not as effective as the other option. Summarizing, planning per weeks and type of activity (2) seems to outweigh planning per topic (3).

v. Design of learning objectives each week during the course

In this section, I analysed whether the fact that instructors dedicated part of their workload to creating a good description of learning objectives during the design phase improved for student engagement. Did students consider it a significant factor that helped them to feel involved in a MOOC, thereby ensuring their participation? They were able to find the learning objectives at the beginning of each new lesson.

Classification of findings:

(0) No list of learning objectives in observed MOOCs.

(1) Simple learning objectives on a weekly basis are defined and displayed to students.

(2) Detailed and accurate learning objectives are defined on a weekly basis.

(3) There is no information related to learning objectives.

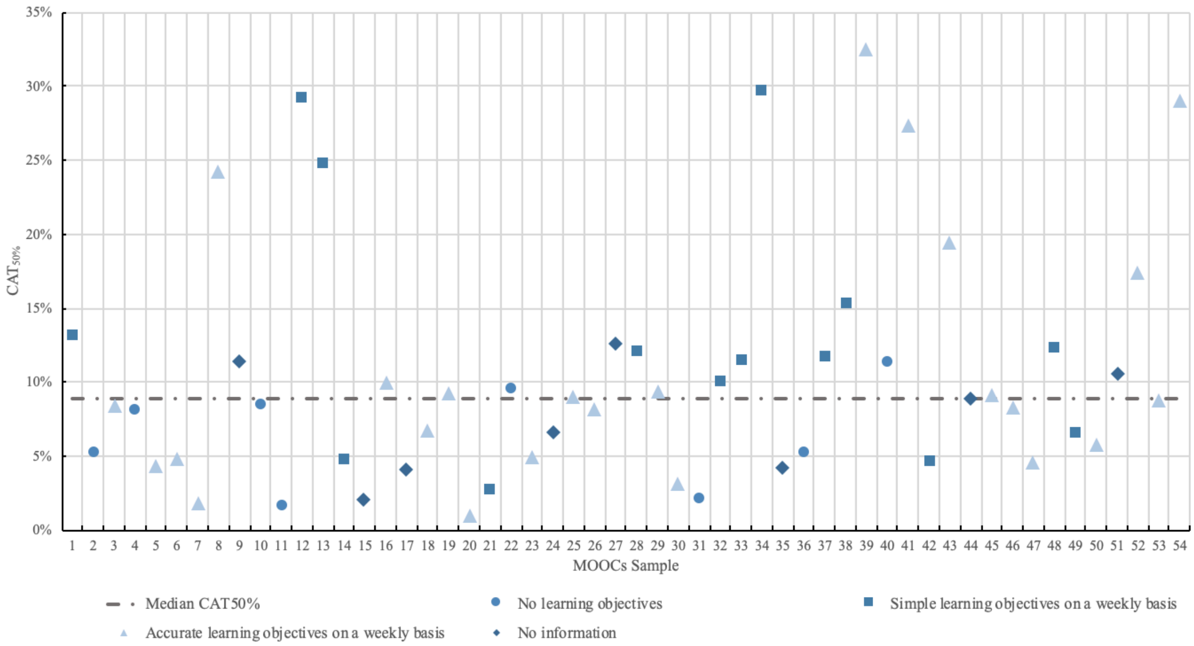


Figure 67. Distribution of $CAT_{50\%}$ per MOOC classified by 'design learning objectives' factor.

It would seem a detailed and accurate design of learning objectives worked best. The fact that the MOOC was planned per week informed students at a glance how the week was planned and what topics would be developed during the course.

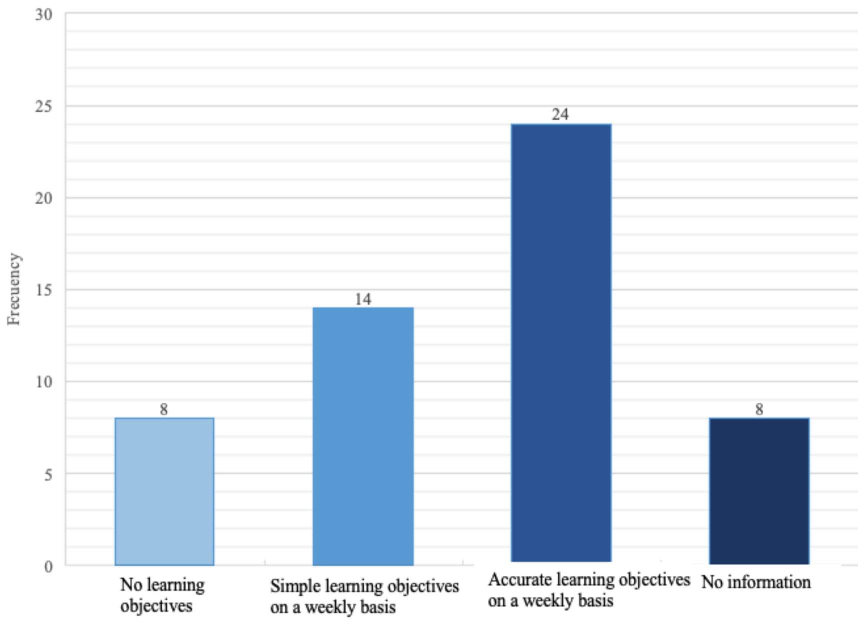


Figure 68. Bar chart of number of MOOCs classified by ‘design learning objectives’ factor.

The presence of learning objectives per week after enrolling (before beginning a new week) was the favourite choice of instructors. Most of the instructors considered this point important and in 44% of the MOOCs it was considered meaningful that this definition of learning objectives should be comprehensive and exhaustive. In other words, accurate.

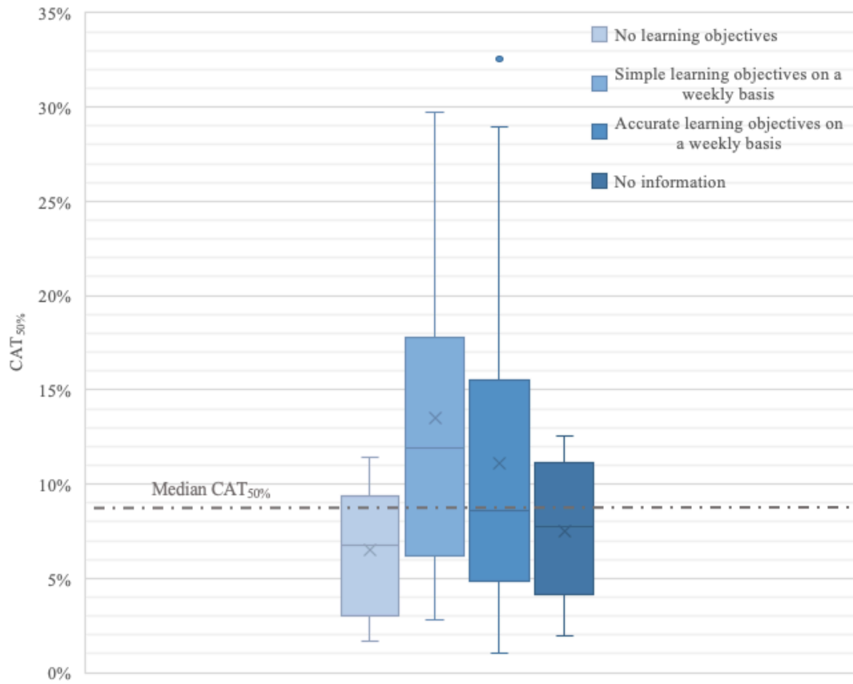


Figure 69. Box plot of ‘design learning objectives’ factor.

From the graph we can infer that student participation was higher when learning objectives were present and described in the MOOC (1) and (2). We also gather from the graph that it was not relevant whether students were provided with a simple or a comprehensive definition of learning objectives. Ultimately, the most important thing was that these learning objectives were present in all sections of the MOOC. However, it is not relevant to describe them in a very comprehensive form.

vi. Other ways of determining the learning objectives – What you will learn

Does the definition of learning objectives in a ‘what you will learn’ mode have a positive impact on students’ participation? One of the platforms offered information in this mode and explained the benefits students could gain from the course.

The following are the classification of findings for the first choice, ‘What you will learn’:

(0) No description of competences that students will gain when they complete the MOOC.

(1) A simple description of competences is described and available to students.

(2) A more accurate description of competences is developed and available to students.

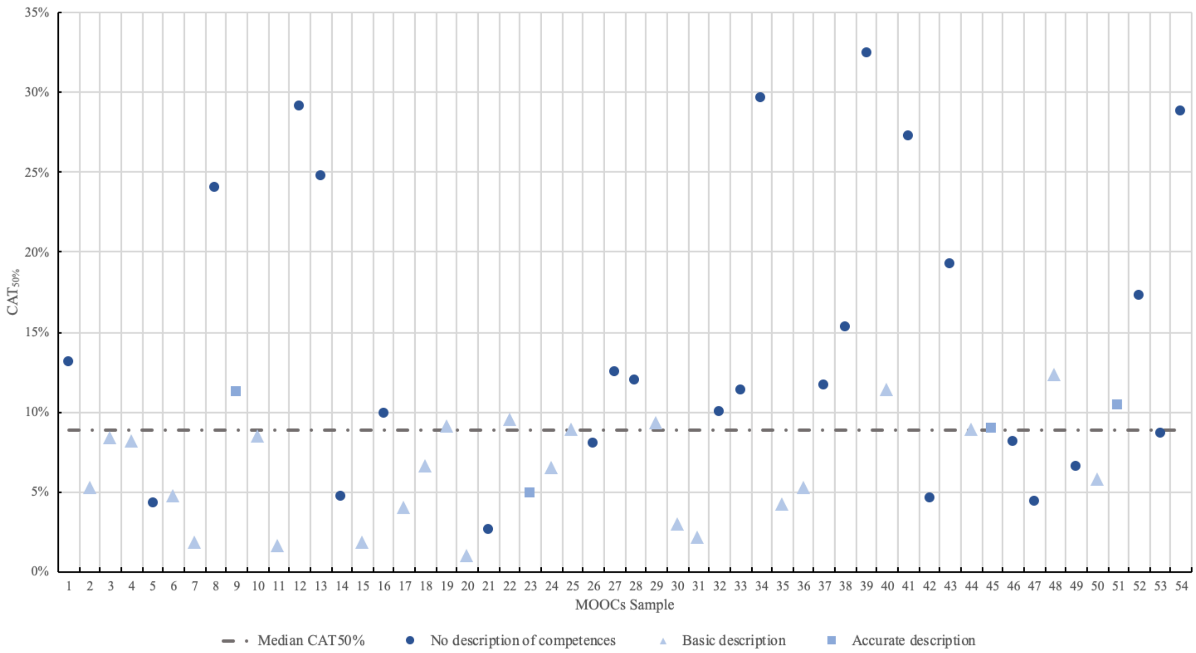


Figure 70. Distribution of $CAT_{50\%}$ per MOOC classified by ‘what you will learn’ factor.

In the observation, I found that in nearly 50% of courses in which competences were designed and displayed, this was done in a ‘what you will learn’ mode. This reflects the fact that this was a characteristic of one of the platforms. In addition, there were only few courses on this platform that offered the ‘what students will learn’ factor in a comprehensive and detailed manner.

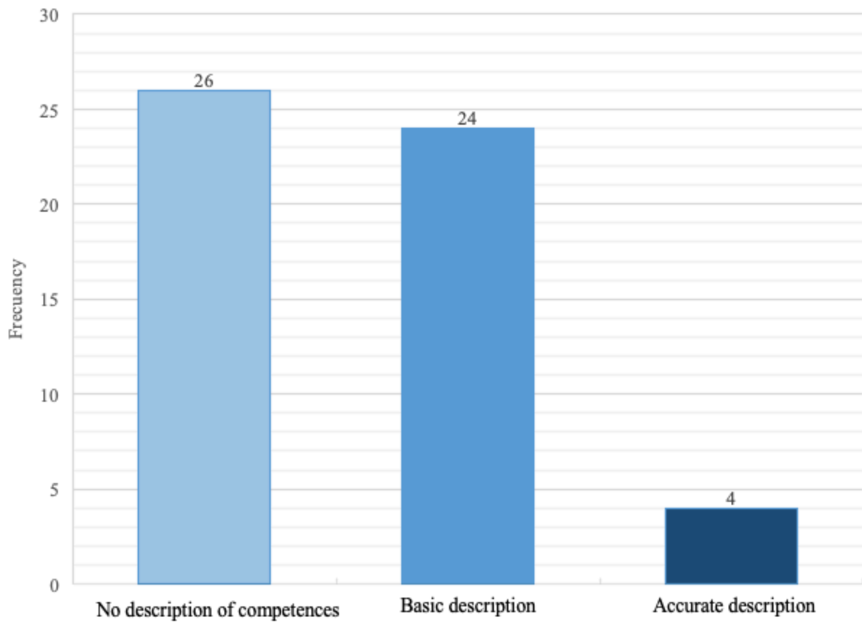


Figure 71. Bar chart of MOOCs number classified by ‘what you will learn’ factor.

As mentioned above, over half the courses provided information about the definition of learning objectives in a ‘what you will learn’ mode. The reason for this is that in the course sample, 26 courses were from platform 1, and 28 from platform 2. The question was whether this had a meaningful impact on students’ engagement during the course.

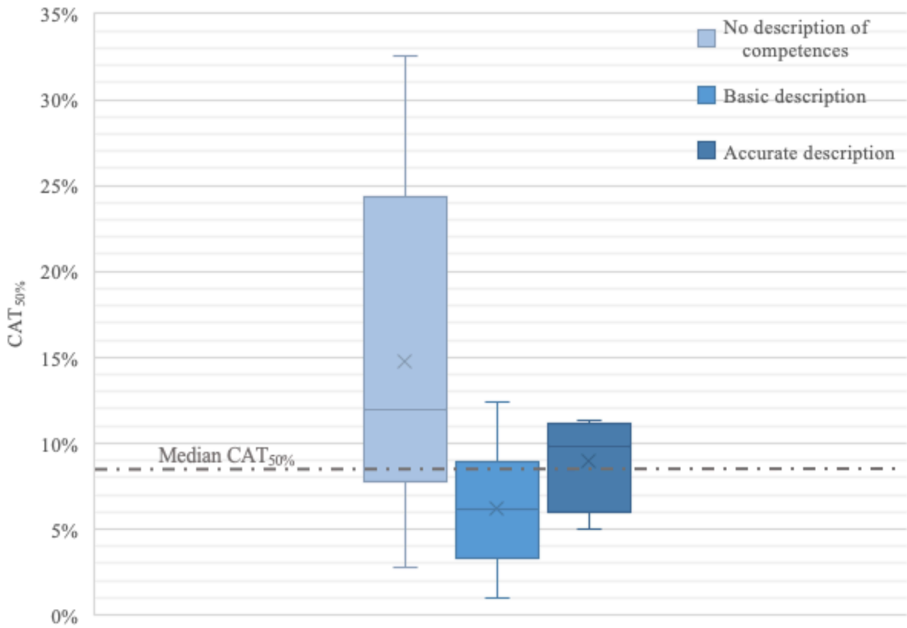


Figure 72. Box plot of ‘what you will learn’ factor.

It seems clear that providing a definition of competences in a ‘what students will learn’ mode did not have an impact on student participation during the course. Thus, this was not a relevant factor for students.

vii. Skills you will gain

Students could find information about what kind of skills they could expect to gain by completing the course successfully. The platform provided this information in a very clear and detailed mode, mentioning skills such as project management, economy, environmental protection, and so on. Did this help students to form another perspective on what they could achieve through learning and thus, did this encourage student participation?

The classification of findings was as follows:

(0) MOOCs in which one cannot find described skills that students will gain during the course.

(1) MOOCs in which the skills students will attain once they finish the learning process successfully are described.

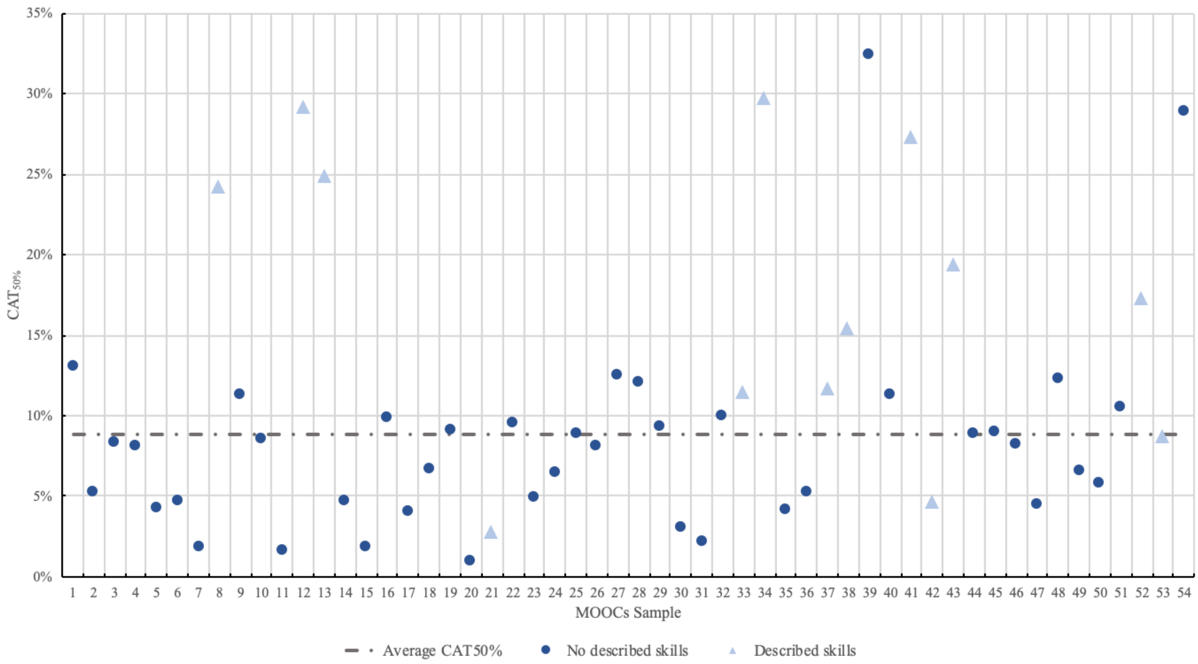


Figure 73. Distribution of $CAT_{50\%}$ per MOOC classified by ‘skills you will gain’ factor.

It seems that a description of the skills taught in the course was not regarded by instructors as valuable information.

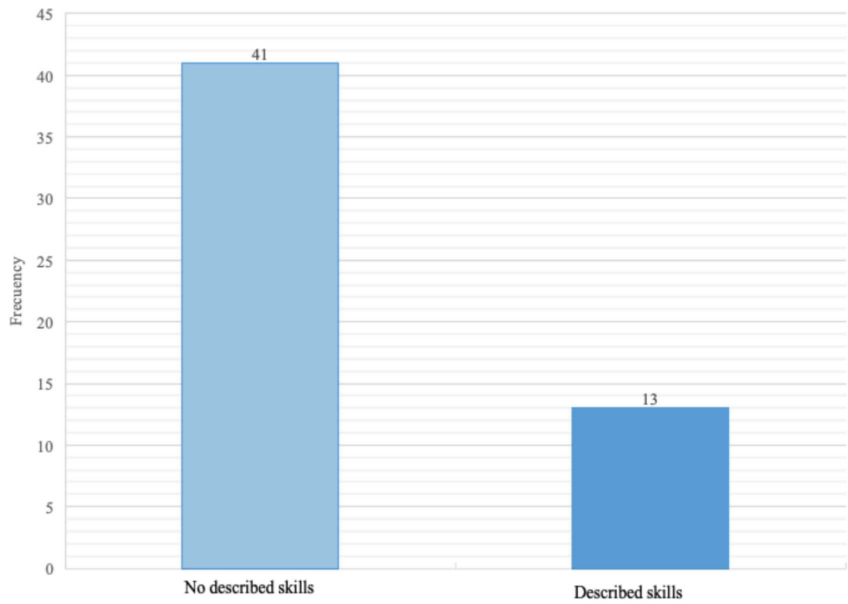


Figure 74. Bar chart of MOOCs number classified by ‘skills you will gain’ factor.

In more than two thirds of observed courses, ‘skills you will gain’ was a factor that was not developed by instructors. I assessed whether, in spite of this, it provided added value to both institutions and students if this option was included in the design of MOOCs. In other words, did the fact that the MOOC displayed this kind of information make students feel more certain that the course would meet their needs?

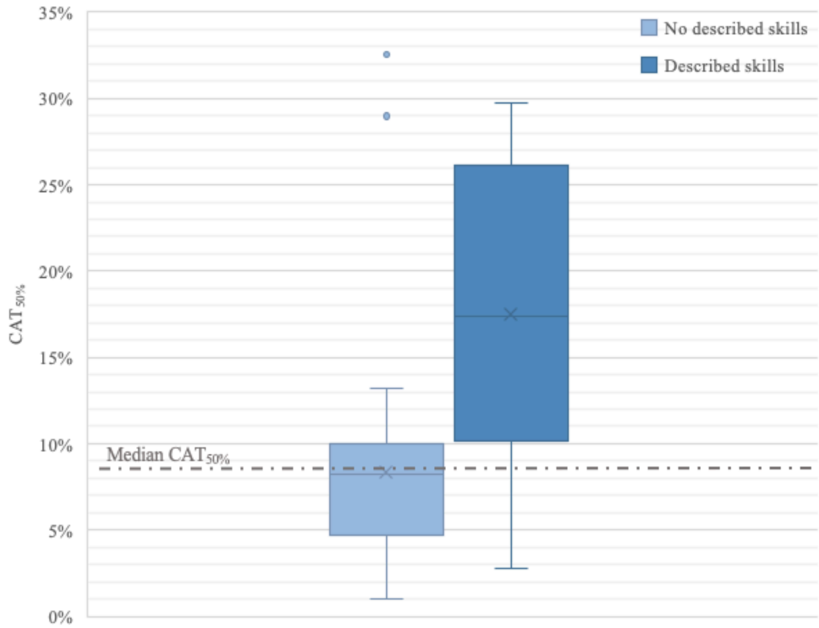


Figure 75. Box plot of ‘skills you will gain’ factor.

In the graph it is clear that MOOCs in which the ‘skills you will gain’ factor was described, student participation was significantly higher. It would appear that this is a factor fostered student participation.

Which entry-levels are the learning objectives addressing (e.g. beginners, intermediate, advanced, novice, experts)? (P)

i. Level of the course: Introductory, intermediate, advanced

As mentioned in section II, this factor was expected to indicate whether there was a particular level of participants that felt more committed and was more constant when completing a MOOC. Was there a target audience that felt more sensitive and more committed to maintain their participation in a MOOC? The levels that MOOCs targeted were:

introductory, intermediate and advanced. Ultimately, did the entry level of a MOOC have any influence on student participation?

Classification of findings:

(0) MOOC aimed at beginners.

(1) MOOC aimed at intermediate students.

(2) MOOC aimed at advanced students.

(3) There is no information related to entry level.

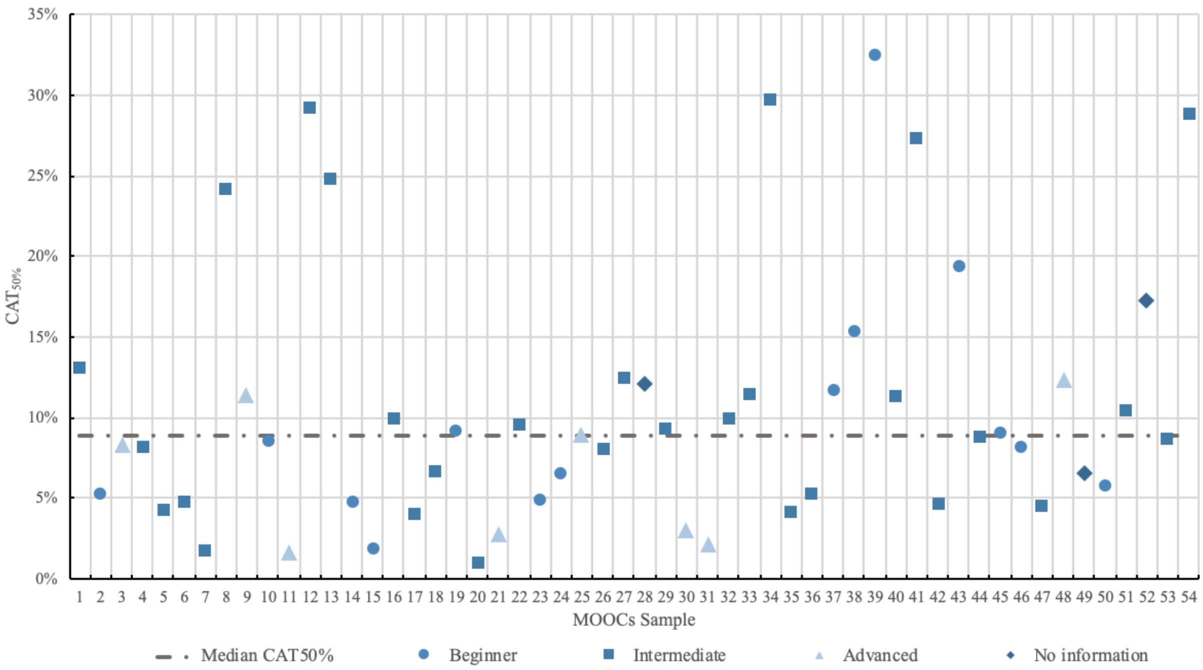


Figure 76. Distribution of $CAT_{50\%}$ per MOOC classified by ‘level of course’ factor.

From the graph, it is evident that there was a variety of courses at various levels in the sample of MOOCs.

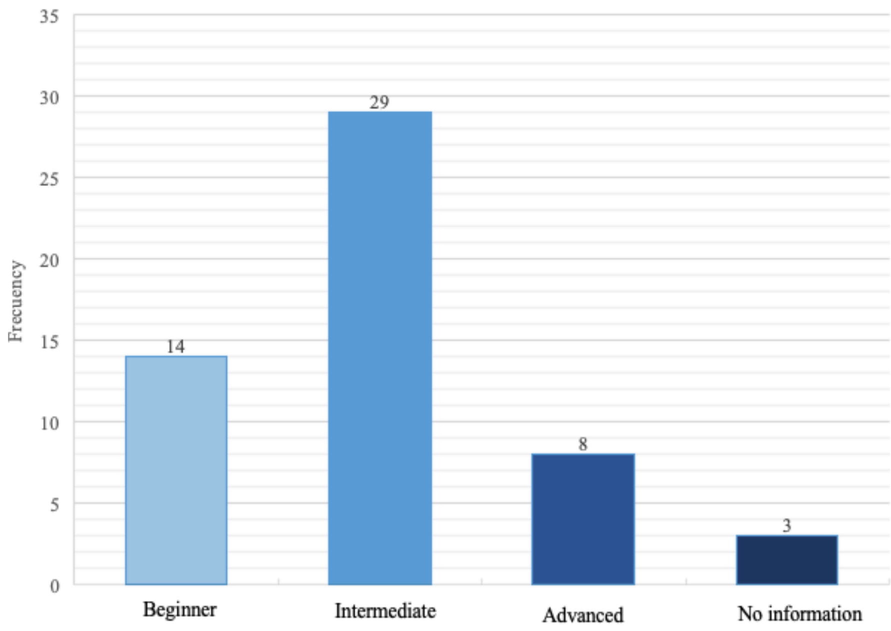


Figure 77. Bar chart of MOOCs number classified by ‘level of course’ factor.

Most MOOCs were aimed at the intermediate and beginner levels. This may be because every institution has an educational strategy, and courses are focused on a specific kind of target audience. However, in terms of business issues, from my viewpoint, institutions are focused on the target audience that is closest to the institution. This is a way of ensuring that MOOCs have a good uptake by students.

From this diagram, it can be inferred that instructors defined, described, developed and focused the MOOC from the design phase. Thus, they considered at the outset the level of audience the course was designed for.

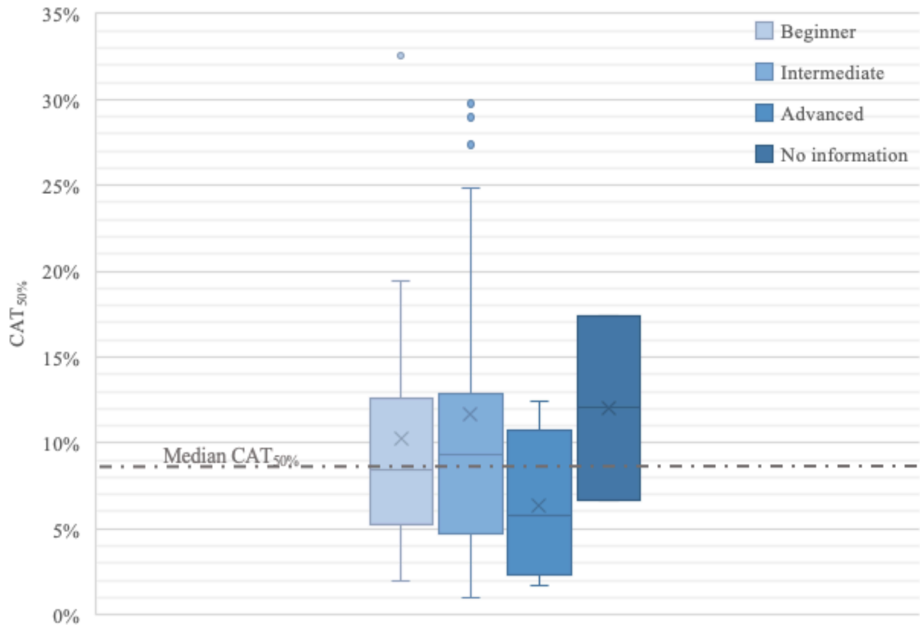


Figure 78. Box plot of 'level of course' factor.

In the graph, student participation remained high for beginner and intermediate choices. When MOOCs were focused on master's level students, there was a decline in student participation. In addition, there was a fourth option, where the MOOC was not aimed to a specific target audience, but the numbers in this sample were not large enough to confirm a reliable estimation of whether a MOOC that does not focus on a particular level works well.

In summary, when a MOOC was addressed to the beginner and intermediate level, this encouraged students to participate in the course.

How are the learning objectives assessed (e.g. formative assessment, weekly quizzes, multiple-choice tests, delivery of a product, essay, final exam)? (P) (S)

i. Evaluation of learning objectives: through weekly quizzes, multiple choice tests, final exam

As mentioned in section II, the second most important aspect that instructors consider when they design a MOOC is assessment. I identified the kind of assessment chosen by instructors in MOOCs.

Referring to Zhu, Bonk and Sari's (2008: 215) paper, the favourite types of student assessment that instructors chose to include in their MOOCs were as follows:

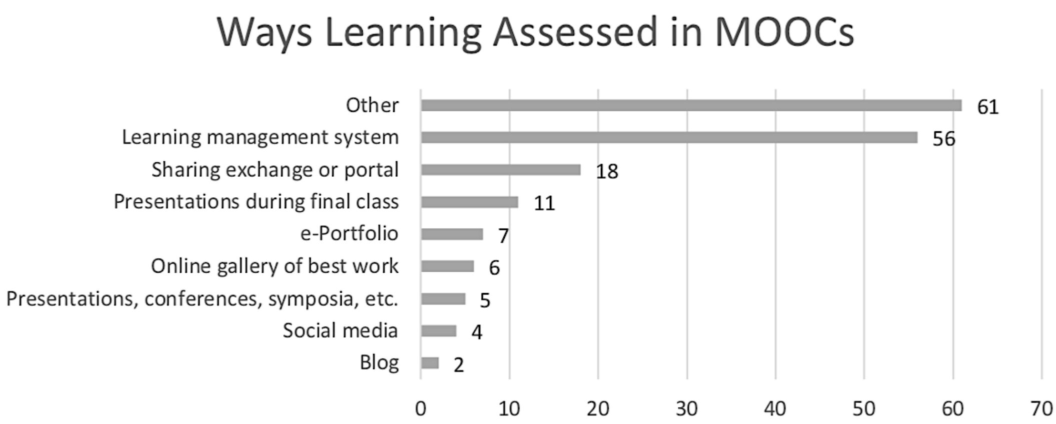


Figure 79. Way learning is assessed in MOOCs (Zhu, Bonk & Sari, 2008: 215).

The graph reflects that 61 instructors from a survey of a total of 143 participants in the study, representing 42% of all instructors, chose other ways of learning assessment such as quizzes and peer assessment. The second commonest type of assessment was a learning management system, such as automated grading for multiple-choice questions.

In “Open Cases: A Catalogue of Mini Cases on Open Education in Europe” (Lažetić et al., 2015), one can find, for instance, the study by the Universidade Aberta de Portugal. This university teamed up with a group of other distance-learning institutions in Europe and the European Association of Distance Teaching Universities (EADTU), with support from the European Commission, to create a European approach to MOOCs under the ECO project (http://ecolearning.eu/). The courses that they offered used mostly the formative assessment method.

There are several studies that have investigated formative assessment in MOOCs. For example, Suen (2014) emphasises the fact that a MOOC has to include peer and formative assessment in order to ensure a pedagogical experience for the student. Furthermore, Ventista (2018) describes in her paper that a formative assessment model is the most suitable for MOOCs students because it involves students in peer-assessment and encourages lifelong learning.

During the observation of my sample of MOOCs, the methods of learning assessment most used in courses were quizzes, peer assessment, and automated grading with multiple-choice questions.

Both formative and summative assessment are used by instructors in MOOCs. Nevertheless, formative assessment is the preferred method used to maintain high student participation rates, and to avoid a significant final evaluation that makes students feel overloaded, which has the potential to make them decide to drop out of the course. Ongoing assessment throughout the course has a more positive impact on students than a final assessment.

b) 'Organisational concept and roles' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
ORGANISATIONAL CONCEPT AND ROLES	What is the optimal length of a MOOC? (P) (T) (S)	i. Course length
	How are openness and free access guaranteed? (P)	i. Language: English
		ii. Transcriptions of videos: English, Spanish, Chinese
		iii. Free?
		iv. Providing a verified certificate at an affordable fee
		v. You can upgrade to verified certificate at any time during the course
		vi. Which institution? University?
		vii. Is financial aid available? Or a scholarship?
		viii. Meet the instructors
		ix. Issue: Hard sciences or soft sciences

Figure 80. 'Organisational concept and roles' process.

What is the optimal length of a MOOC? (P) (T) (S)

i. Course length

As discussed in section II, the classification of findings by week were as follows:

(0) intervals up to 30 h

(1) intervals between 30 h and 40 h

(2) intervals between 40 h and 50 h

(3) intervals more than 50 h

When information about hours to complete is shown on the website, I noticed that the released number of hours to complete were the minimum number of estimated hours of application. For example, when it is stated in a MOOC that the course would take approximately 44 h to complete, this can be read as four to six hours per week, thus 11 weeks. Platforms choose the minimum number of planned hours of 4 - 6 h in order to attain the total number of hours to complete in the course, i.e. 44 h. This practice is a marketing strategy used to avoid frightening off potential students.

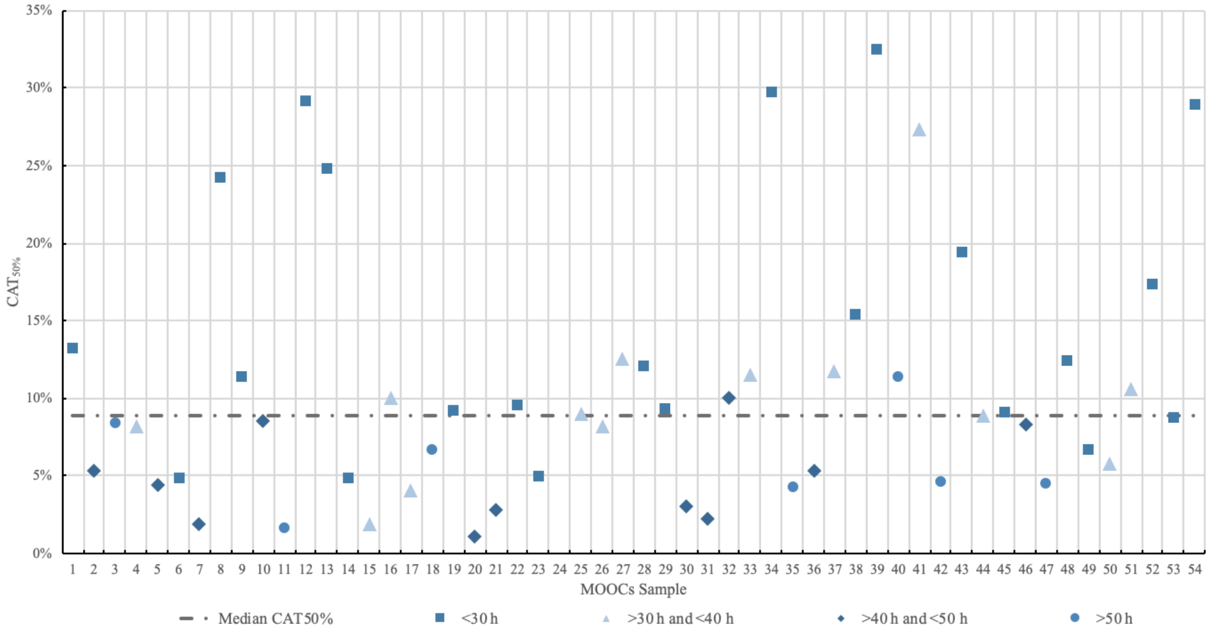


Figure 81. Distribution of $CAT_{50\%}$ per MOOC classified by 'course length' factor.

It seems that MOOCs of fewer than 30 hours are the most numerous. The findings on this course pattern are reflected below.

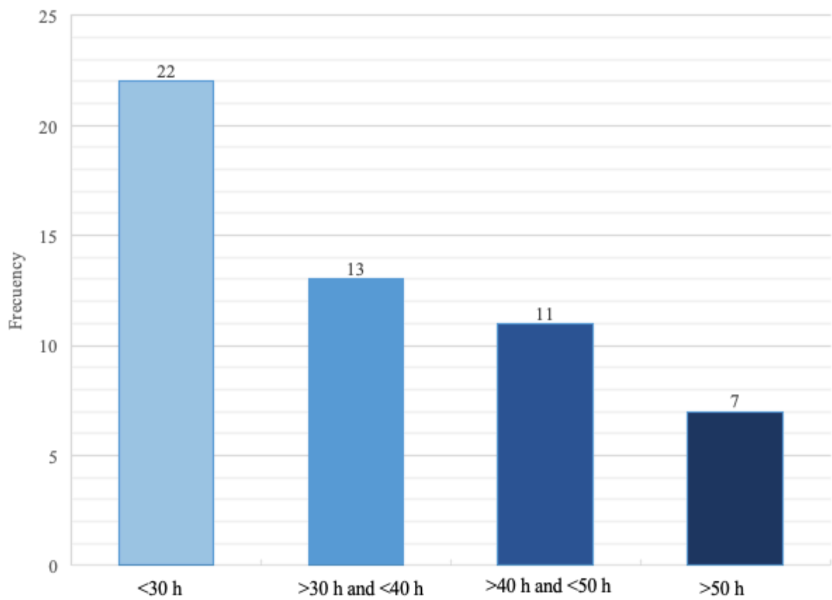


Figure 82. Bar chart of number of MOOCs classified by 'course length' factor.

The bar chart confirms that almost half the MOOCs had a course length of fewer than 30 hours. This was the choice of most platforms/providers. However, it was also usual to find courses that were longer than 30 hours. There were several courses patterns.

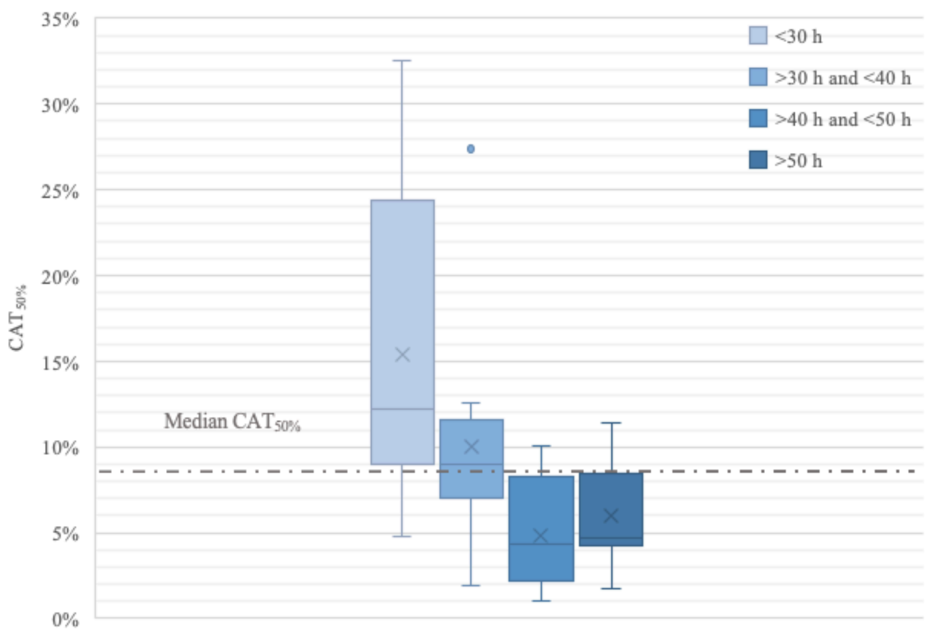


Figure 83. Box plot of ‘course length’ factor.

The graph shows that the trend in MOOCs with a course length of more than 40 hours was to have lower student participation. However, it appeared that those with a course length of fewer than 40 hours worked best. Thus, course length was a factor that had a strong influence on student participation.

How are openness and free access guaranteed? (P)

i. Language: English

As noted in the previous section II, MOOCs are designed to reach a large number of students. At this point, language has a meaningful role; because English is possibly the most used international language globally. It may be, however, that the use the local language of the country in which the MOOC is made available may make students feel more confident about participating in the course. This could have a significant impact on student engagement.

Below is the classification of findings:

(0) English

(1) French, the local language

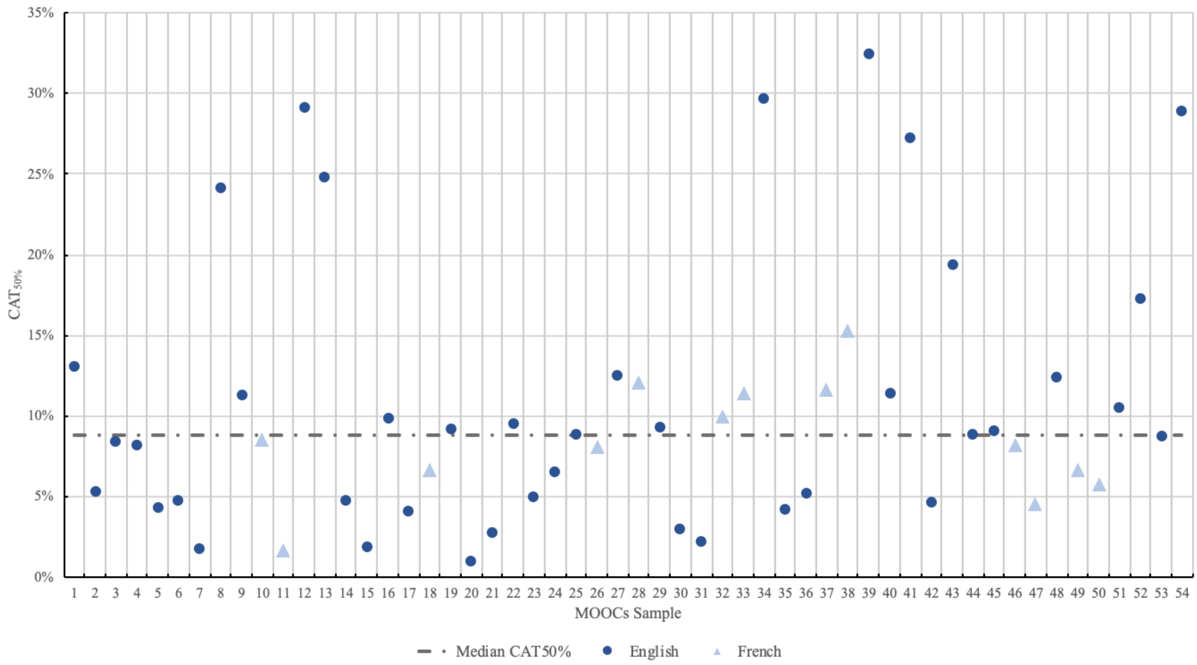


Figure 84. Distribution of $CAT_{50\%}$ per MOOC classified by 'language' factor.

The sample of 54 courses plotted on the graph indicates that there were many more courses offered in English than in any other language.

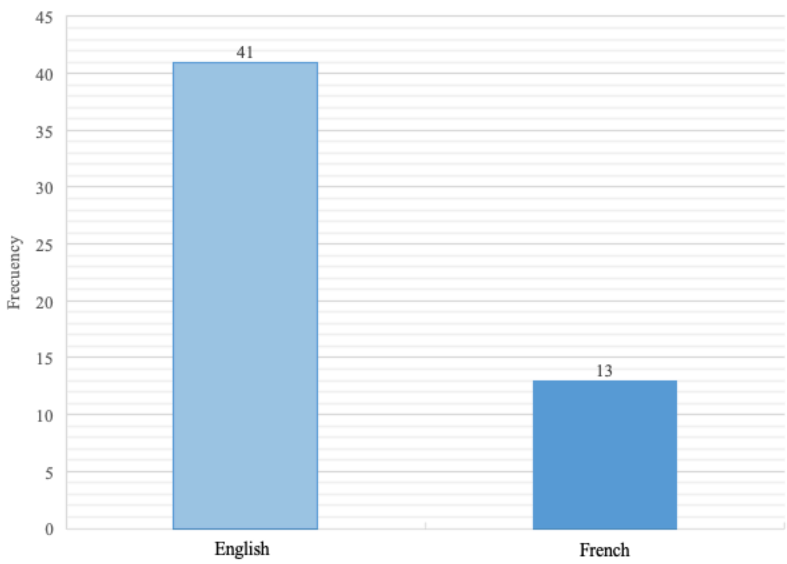


Figure 85. Bar chart of number of MOOCs classified by 'language' factor.

The majority of courses in the sample, 75%, were offered in English. I investigated whether the fact that a course was offered in a major world language such as English had an influence on student engagement.

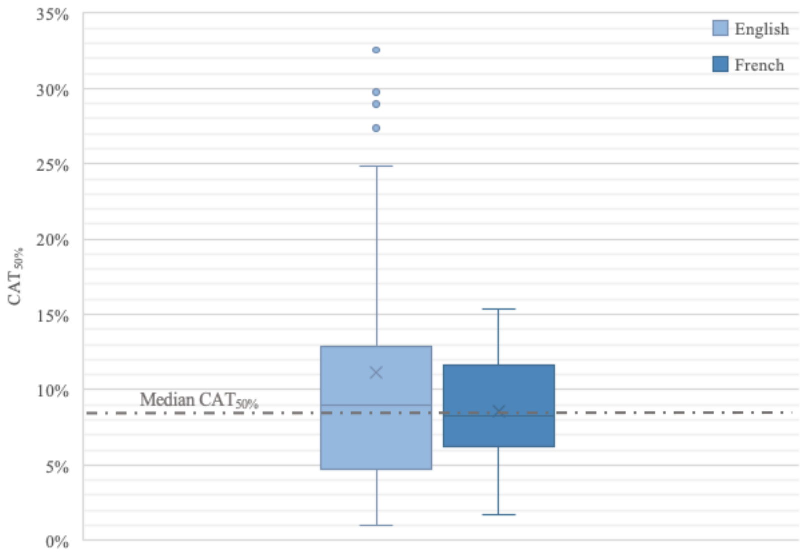


Figure 86. Box plot of ‘language’ factor.

The graph indicates that the median of two variables was almost the same. The English variable was a bit higher than the French variable. Thus, one could conclude that language was not a significant factor in determining high levels of student participation. However, it could be claimed that MOOCs presented in English motivated students to participate in the course. In this case, language was not a deterrent to students wishing to engage in a course.

ii. Transcriptions of videos: English, Spanish, Chinese

Do the findings bear out the assumption that transcribing and captioning videos encourages student participation?

The classification of findings from the observation was:

(0) There is only transcriptions in English.

(1) There are only transcriptions in French, the local language.

(2) There are transcriptions in two or more languages.

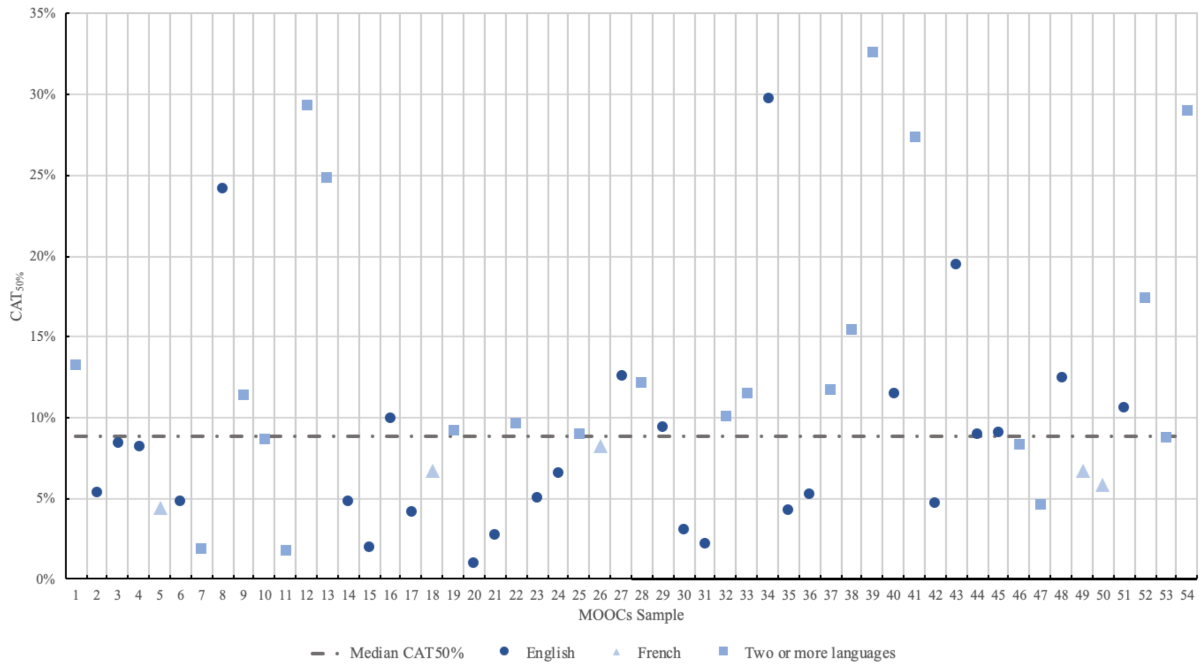


Figure 87. Distribution of $CAT_{50\%}$ per MOOC classified by ‘transcription’ factor.

At first glance, it could be interpreted that student engagement was higher in those MOOCs in which transcription and captioning of videos was in two or more languages. I investigated whether this was actually that the case.

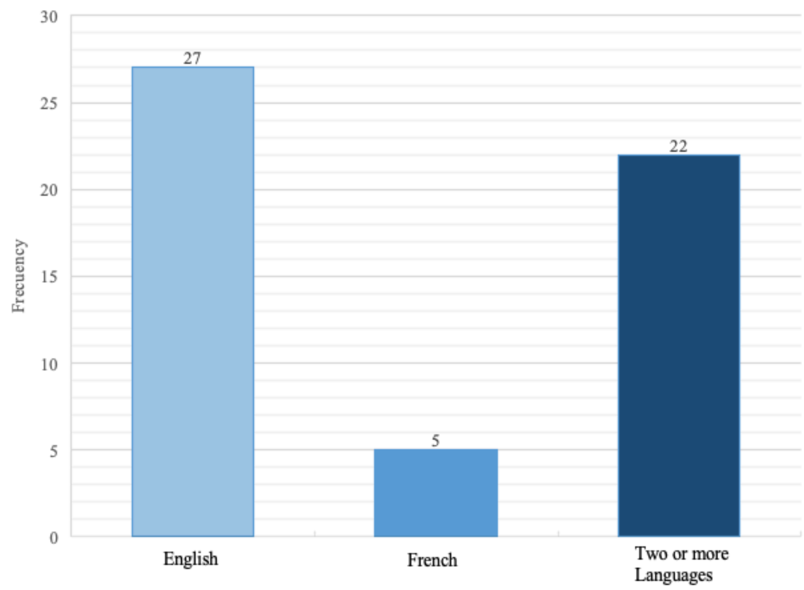


Figure 88. Bar chart of number of MOOCs classified by ‘transcription’ factor.

All MOOCs in the sample provided lecture videos with transcriptions and captions in various languages: (1) in English, (2) in French, and (3) in two or more languages. The trend was for instructors to provide video transcriptions in options (1) and (3). In other words, platforms/providers included English in transcriptions as an international language in all courses. This suggests that instructors thought that students considered this an important factor and thus it was essential that they included it in the design process.

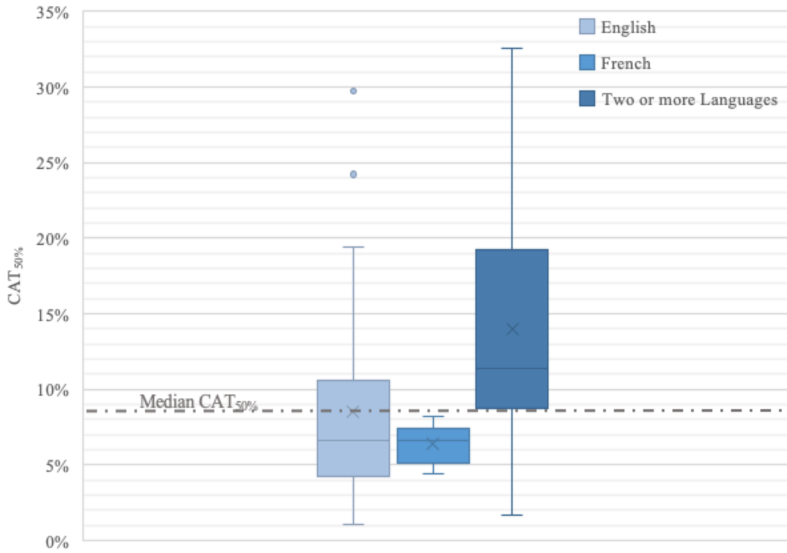


Figure 89. Box plot of 'transcription' factor.

The graph shows that in the third option, in other words in MOOCs in which lecture videos included transcriptions and captions in two or more languages, student engagement was clearly higher than for the other two choices. Thus, the fact that transcriptions in two or more languages were included encouraged student engagement.

iii. Free?

Does the fact that MOOCs are gratis have any impact on student participation? Is this a motivation for potential students to decide to enrol in a course? Does the fact that a MOOC is cost-free have any impact on student engagement?

Classification of findings:

(0) Free to unlimited course access.

(1) Free access, but no access to some of upgraded quizzes or the final exam.

(2) No information on this aspect.

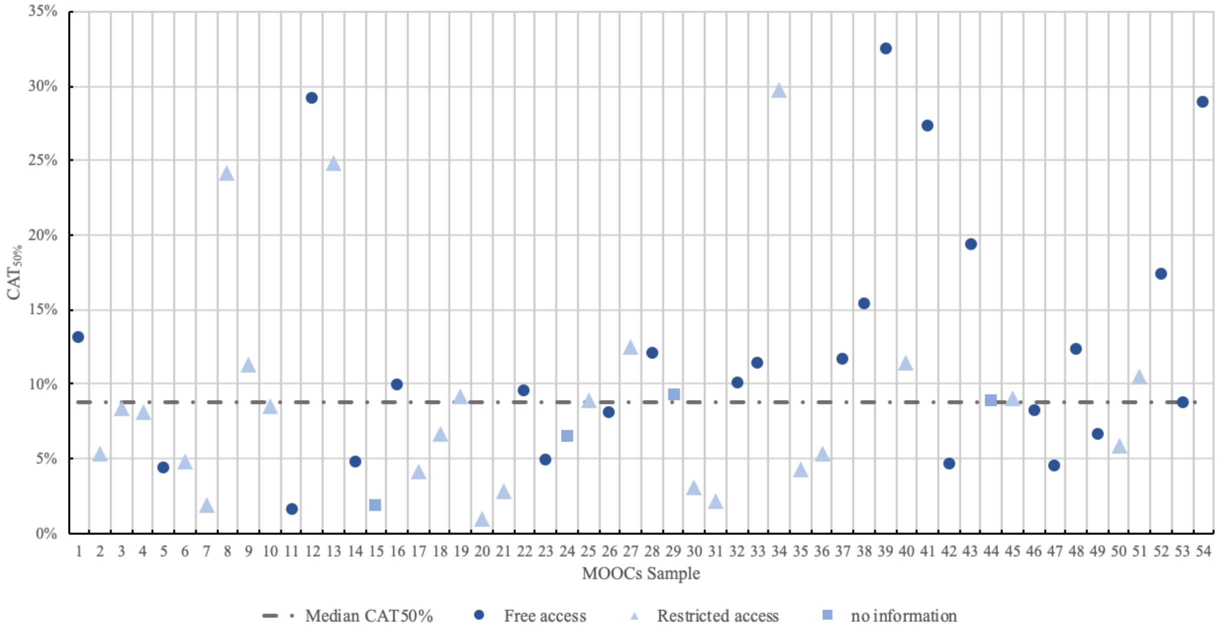


Figure 90. Distribution of $CAT_{50\%}$ per MOOC classified by 'access' factor.

During the monitoring process, it seems that MOOCs are still in an early stage. To provide courses as free-cost is a bid to appeal students to this kind of training. I investigated whether this marketing strategy had any impact on student engagement.

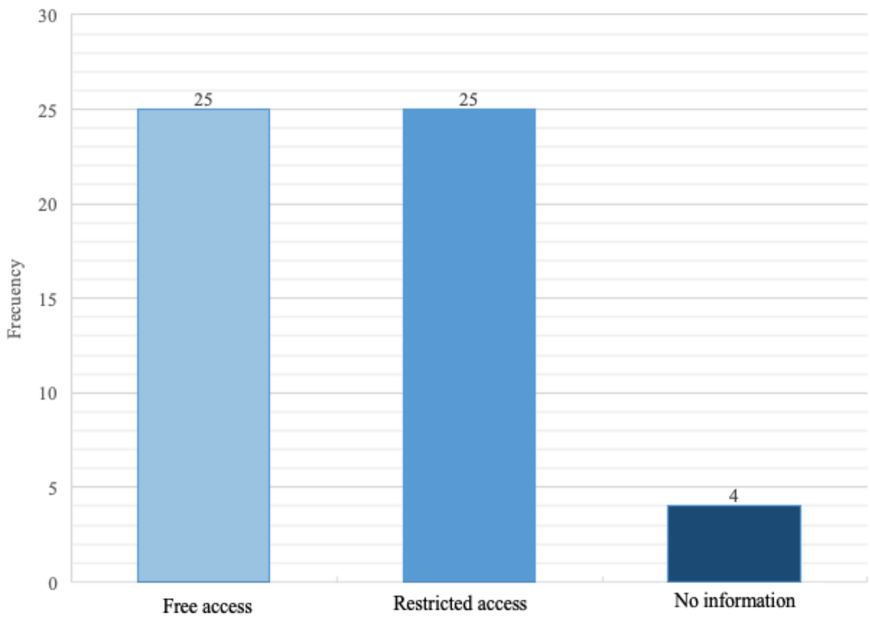


Figure 91. Bar chart of number of MOOCs classified by 'access' factor.

In the monitoring process, I found a balance between the offer of free access to MOOCs and MOOCs with restricted access. In my view, this was a signal that MOOCs were a step further towards consolidating their role as meaningful and essential training through which students could complete their professional and transferable competences. In other words, institutions are increasingly investing in MOOCs. On the other hand, MOOCs still have a long way to go as they are very new in the area of training.

Institutions/providers began to restrict access to some MOOCs, giving rise to two effects:

1. In the case of free courses, students are in touch with this kind of training.
2. In the case of restricted courses, institutions place value on MOOCs, and try to make them a source of income for the institution.

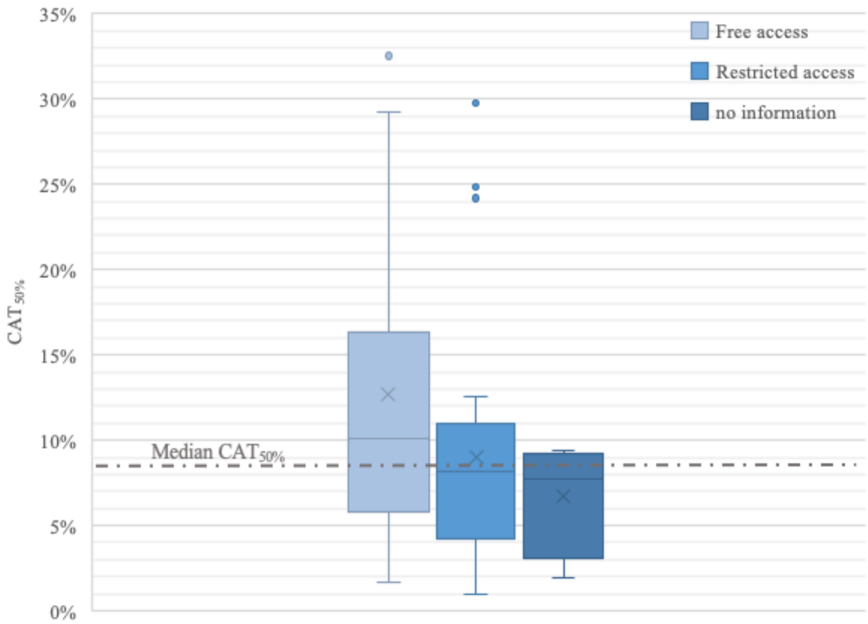


Figure 92. Box plot of ‘access’ factor.

One can infer from the box plot that there was a higher rate of student engagement when free access was provided to the whole course. The outcome was better in the first choice (free access/cost-free). Therefore, we could say that MOOCs were still in the early stages of acceptance as official training. Providers might undertake new strategies, for instance, including MOOCs in official training as part of a degree curriculum. However, we must not forget that MOOCs are courses that should feed curiosity and the need to study new fields of knowledge; they should continue being free of cost in some way.

iv. Providing a verified certificate for an affordable fee

Verified certificates have been developed in a bid to enhance student engagement in MOOCs. This is a further step towards establishing MOOCs as official training. Several reasons lead students to enrol in a MOOC, and one of these is the extrinsic value of achieving a verified certificate (Hew, 2015: 325).

In the study “Open Cases: A catalogue of mini Cases on Open Education in Europe” (Lažetić et al., 2015), a verified certificate was part of MOOCs. In some cases, certificates were only recognised by the university at which they were offered, such as the University Guglielmo Marconi (Italy). Others, such as Leuphana University in Germany recognised certificates as ECTS. Ultimately, the researchers found that the offer of a verified certificate by a MOOC was a must to appeal to students.

In their study “Instructor experiences designing MOOCs in Higher Education: Pedagogical, resource, and logistical considerations and challenges”, Zhu, Bonk and Sari highlight some of the strategies used to engage students. Among these are providing certificates as a way of making students feel committed and actively engaged in a MOOC (2018: 21).

Figure 93. Ways to engage MOOC students in learning process (Zhu, Bonk and Sari, 2018: 216).

For instance, authors such as Dillahunt, Wang, and Teasley (2014, as cited in Zhu, Bonk & Sari, 2018: 206) found that MOOC students who could not afford formal higher education had high completion rates when they had the goal of achieving a certificate.

In the current study, all the MOOCs in the sample offer a verified certificate to students who completed the course.

v. You can upgrade to 'verified' at any time during the course

This choice allows students to choose the moment at which they want to enrol in a MOOC. Students do not want to invest in a course until they are sure that they will pass the MOOC, even though courses have affordable fees. This is an interesting marketing strategy to avoid making tuition fees a barrier to enrolling in a course. MOOCs are still at an early stage of development, and any strategy which allows students access to a course so that they can experience how the learning process is going to be performed, is very welcome. Students may even find more affordable tuition fees as platforms may offer unlimited access to hundreds of short courses for a year at a better price than students would pay for an individual MOOC.

vi. Which institution? University?

As mentioned in section II, institution data are confidential. Would the institution be an incentive for students to enrol in a MOOC?

Shah (2019c) explains in his article that in 2019 there were more than 13,000 MOOCs from approximately 1,000 universities. The list was based on 60,000 user reviews. With such high numbers of MOOCs, students search for some criteria to decide which to choose. Thus, the opinion of other students is a meaningful and easily accessible source for potential students and will help them to feel that they have selected a suitable course. Thus, the institution offering the MOOC is important.

> To generate the list, we sorted the courses in our database by the Bayesian average of their ratings, then removed courses with fewer reviews and courses that have been discontinued.
>
> The Top 100 List features courses from 53 universities in 18 countries:

Three universities have 5 courses in the top 100: Massachusetts Institute of Technology (US), University of Sheffield (UK), University of Cape Town (South Africa).

Three other universities have 4 courses in the top 100: Stanford University (US), University of Michigan (US), and University of Pennsylvania (US).

And six more universities have 3 courses in the top 100: Hong Kong University of Science and Technology (Hong Kong), Galileo University (Guatemala), Georgia Institute of Technology (US), University of Tasmania (Australia), Monash University (Australia), Universitat Politècnica de València (Spain).

Coursera is the top course platform with 45 courses, followed by edX (24) and FutureLearn (17). (Shah, 2019c)

This is a broad generalisation of student preferences. It is also important to know the area of knowledge they belong to. However, this information suggests that students do take the institution that offers the course into consideration when choosing a MOOC.

vii. Is financial aid available? Or a scholarship?

Despite criticism, one can say that the democratisation of education is here to stay. Although much remains to be done, increasingly more students have access to training, which was unthinkable before. Financial aid is one of the tools students can use to make this a reality. More underprivileged students have the chance to access to this kind of training. It is essential that MOOCs maintain this over time. Besides the social programmes this means, students with financial aid can trust in MOOCs for their future training. Furthermore, other students may feel an interest in this kind of training that has a relevant role.

viii. Meet the instructors

One of the factors that students consider significant when engaging in an online learning experience, is the accessibility of instructors (Hew, 2015: 320). It is significant from the beginning that students are in touch with instructors. Constant connection with students makes them feel involved and committed to the learning process. Furthermore, Zhu, Bonk, and Sari (2018: 222-223) argue that keeping up a connection with students allows instructors to identify the most suitable approach to meeting students' competencies and needs. One can find an example of some of the strategies used to form and strengthen the bond between instructors and students in the last section 'Meet the instructors' in section II. In the next figure, some of strategies used to address students' different competences and needs are reflected.

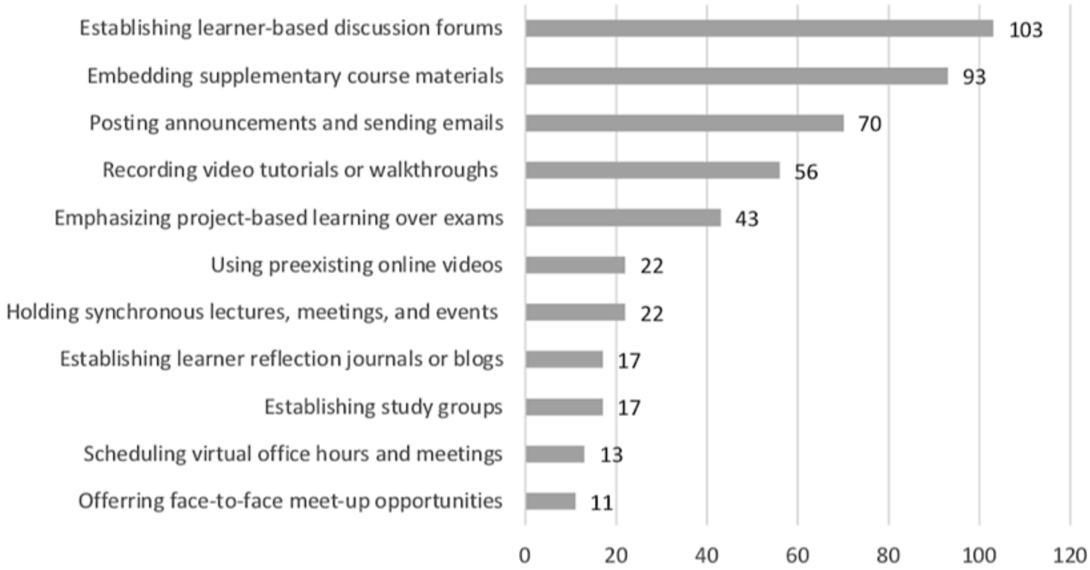


Figure 94. Ways to address learners' competences and needs (Zhu, Bonk and Sari, 2018: 217).

ix. Issue: Hard sciences or soft sciences

As mentioned in section II, the institution that provided the data for this study focuses on hard sciences. I aimed to identify whether there were areas of knowledge in which there were high rates of student engagement.

Classification of findings:

(1) Architecture, Civil and Environmental Engineering

(2) Basic Sciences

(3) Engineering

(4) Computer and Communication Sciences

(5) Life Sciences

(6) Management of Technology

(7) Aquatic Science and Technology

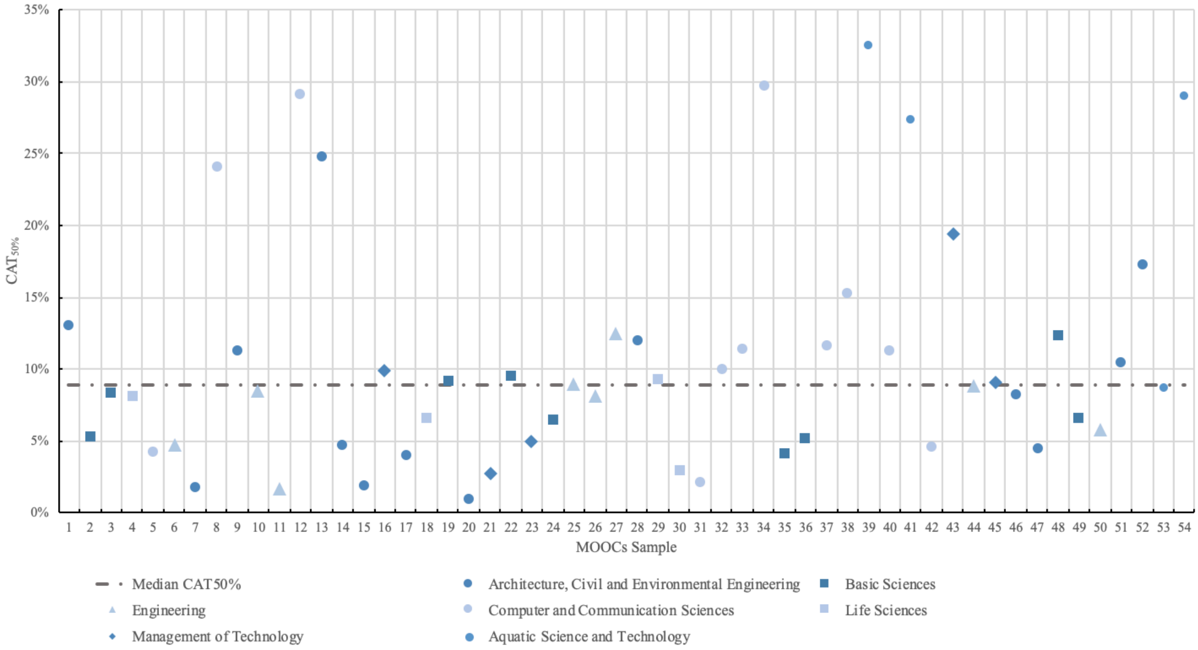


Figure 95. Distribution of $CAT_{50\%}$ per MOOC classified by ‘knowledge area’ factor.

A variety of knowledge areas was represented in the sample. I wished to identify whether there was a particular area that had maintained a high level of student participation.

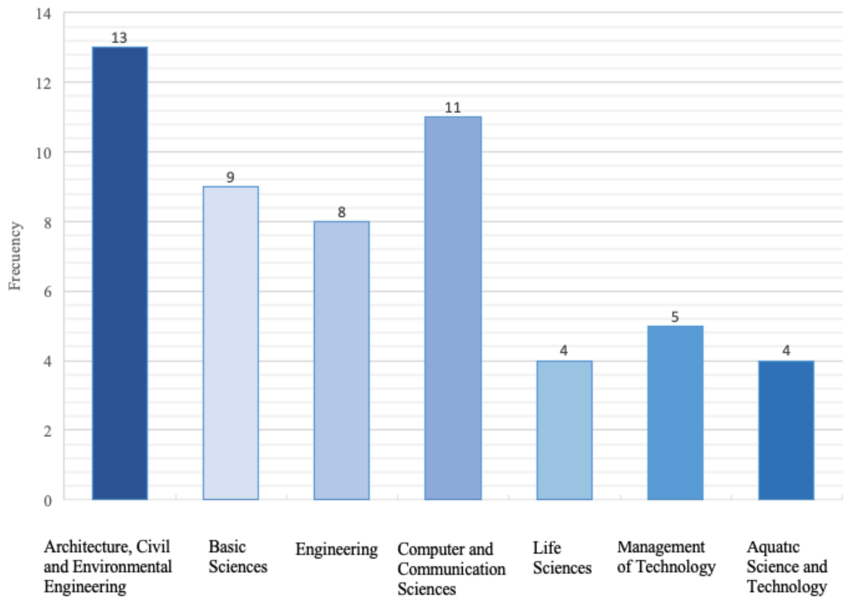


Figure 96. Bar chart of MOOCs number classified by ‘knowledge area’ factor.

It was clear that there was a wide variety of knowledge areas covered by the courses in the sample. All were from the hard sciences.

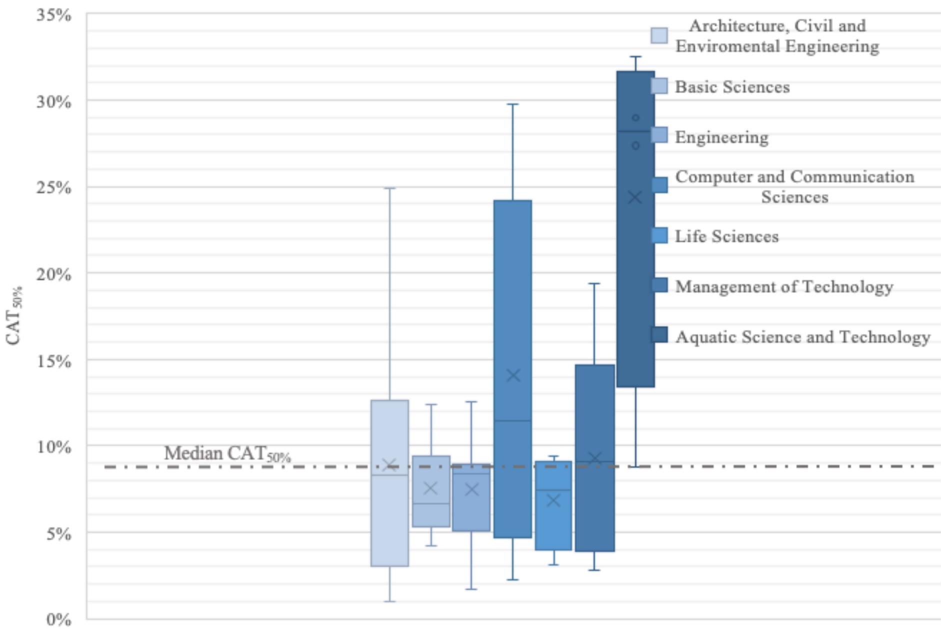


Figure 97. Box plot of ‘knowledge area’ factor.

The box plot shows that area of knowledge where rates of student engagement were highest, was courses linked to ICT (information and communications technology). The courses chosen most often by students were ‘computer and communication sciences’ and ‘aquatic science and technology’. The fact that these courses had integrated digital skills as their basis may have attracted students. This suggests that students from other disciplines may have required further training in ICT. One way to achieve this would have been to include this ICT training as a compulsory course within their official disciplines.

c) ‘Didactic concept and methods’ process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
DIDACTIC CONCEPT AND METHODS	Which didactic principle is the focus (e.g. self-regulated learning, direct instruction, reflective learning, collaborative learning, emotional learning)? (P)	i. SDL (Self-directed learning), direct instruction, reflective learning, collaborative learning
	Are personalisation and selection of own learning pace and pathway realized? If, yes, how? (P) (T)	Self-paced
		Flexible learning
	What methodologies are used (e.g. active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based)? (P)	active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based
	How are the didactic principles and methods communicated to the learners (e.g. orientation module, introductory unit, task guidelines)? (P)	i. Workload/week
		ii. Course structure: week 1, week 2, week 3…

Figure 98. ‘Didactic concept and methods’ process.

Which didactic principle is the focus (e.g. self-regulated learning, direct instruction, reflective learning, collaborative learning, emotional learning)? (P)

i. SDL (Self-directed learning), direct instruction, reflective learning, collaborative learning

It is true that SDL is an aspect to consider when a provider is designing a MOOC. Activities should be developed with this in mind. Working online at home is not the same as working on site with fellow students. However, as I mentioned, SDL is not the approach focused on in this project; rather, I focused on factors that were most suitable and interesting to students.

Regarding direct instruction, in the monitoring process I noticed that in MOOCs there was a mix between direct instruction and constructivist methods. Instructors had the role of guiding students through the learning process and providing students with the contents, such as lecture videos, presentations, or readings. As in constructivist methods, there were discussion forums. This tool was present in all observed MOOCs. It places students at the centre of the learning process, and was used by instructors to make them reflective, critical, and collaborative in their working. This method of communication encourages students to exchange critical information related to the MOOC with other students.

Cultural issues were not evident at first glance in the monitoring process. This aspect may have been considered when instructors kept in close contact with students. There was no valuable information related to this topic.

Are personalisation and selection of own learning pace and pathway realised? If, yes, how? Self-paced and flexible learning (P) (T)

All the MOOCs in the sample allowed students to set their own learning pace. Deadlines for delivering were made clear in courses, reminding students how long they had to organise themselves so that they could complete the course. I argue that this is a relevant point because this encourages students' commitment to the course, and to understand the importance of organising their learning process from the first day. Otherwise, I believe, student dropout rates would be higher than they are currently.

What methodologies are used (e.g. active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based)? (P)

I noticed that all MOOCs were oriented towards active learning. Activities were designed by instructors in such a way as to keep students hooked and active during the learning process. Videos and content to be commented on, discussed, shared and reflected with fellow students through posted comments, are a must in all MOOCs. Students should be given opportunities to participate actively; even if they decide not to share, they should be able to read comments posted by others, and engage in self-reflection. The critical reflection of contents, in terms of the student, allows them to deepen their understanding of the contents at a higher level of learning.

Network-oriented, task-based, interactive and problem-based methodologies should be intrinsic to the conception of the proposed activities. Based on these considerations: (1) activities should be interactive to entertain students, (2) tasks should be network-oriented to build knowledge, the curriculum should be organised by topics, and within it by activities, (3) and problem-based activities should be included in the classroom dynamics in proposed activities through discussions, where students exchange information or contents with their peers. Here the role of instructors and supporters as guides is essential in posing problems and leading discussions.

How are the didactic principles and methods communicated to the learners (e.g. orientation module, introductory unit, task guidelines)? (P)

i. Workload/week

In order to keep students updated on the information necessary to undertake a MOOC, the weekly workload is a meaningful factor that was found in all the MOOCs in this study. In fact, this may be instrumental in students' deciding whether they would be able to cope with a MOOC or not.

Classification of findings:

(0): 1-3 hours' workload per week

(1): 4-6 hours' workload per week

(2): 7-10 hours' workload per week

Note: As explained in the previous factor: 'course length' when classifying the observed MOOCs, I always chose the higher number of hours from the intervals found on the website to classify the MOOCs.

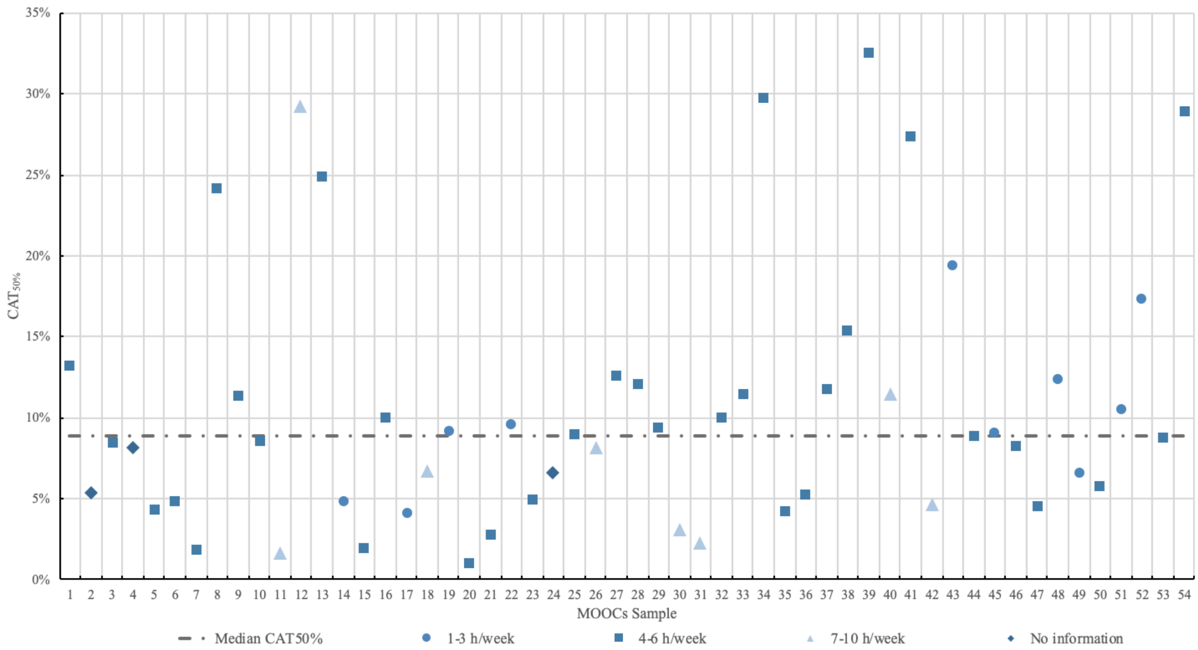


Figure 99. Distribution of $CAT_{50\%}$ per MOOC classified by ‘workload/week’ factor.

One can infer from the graph that courses with a 4-6 hours workload per week were those that worked best, at first sight; several of them were above the median. The following figures are more precise.

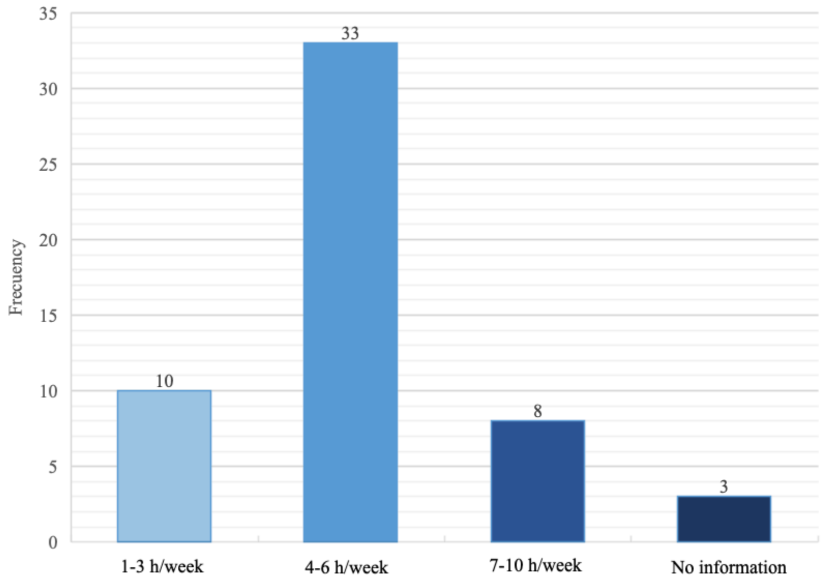


Figure 100. Bar chart of number of MOOCs classified by 'workload/week' factor.

The standard individual MOOC is a course that has a 4–6 hour workload per week. Using this as a reference point, I assessed whether courses with this feature maintained high student engagement rates.

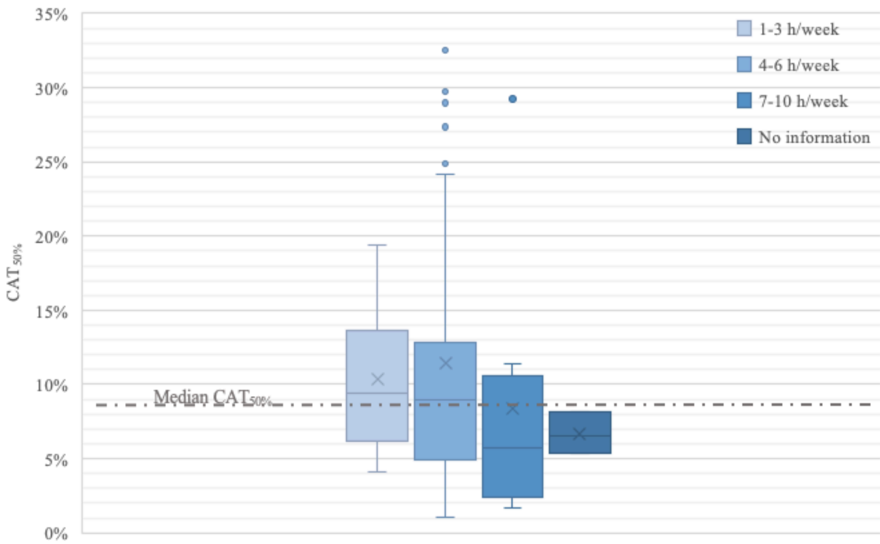


Figure 101. Box plot of ‘workload/week’ factor.

The trend was that students maintained a high rate of engagement when MOOCs included, at most, six hours of workload per week. In other words, when a MOOC extended over more than six hours of workload per week, student engagement dropped sharply. This suggests that the workload/week factor has a direct impact on student participation rates.

ii. Course structure: week 1, week 2, week 3...

Does the course structure by weeks have any impact on student participation rates? What do students prefer? 1) to find a MOOC with a high number of hours by week and shorter duration in weeks, or 2) to find a MOOC with fewer hours per week but that extends over a longer period?

The monitored MOOCs had the following variables:

(0): 1-4 weeks

(1): 5-7 weeks

(2): 8-11 weeks

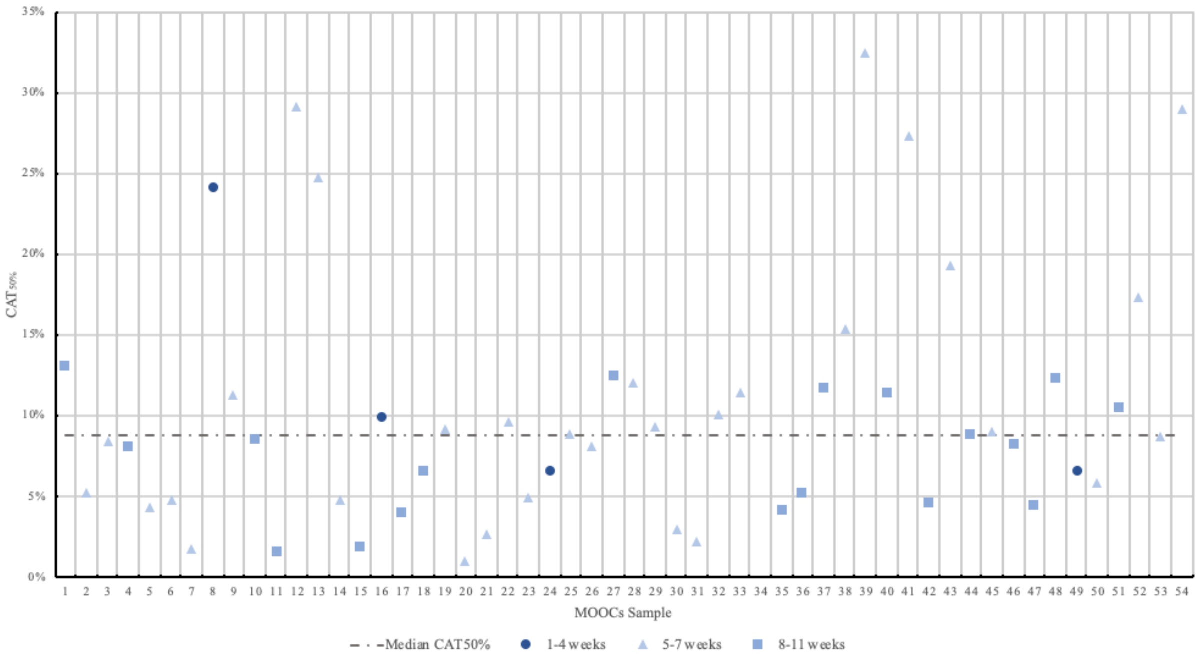


Figure 102. Distribution of $CAT_{50\%}$ per MOOC classified by ‘number of weeks’ factor.

The graph shows that several MOOCs had an average term of 5–7 weeks. This seemed to be the trend among providers. However, I wished to determine whether this was the course length that worked best.

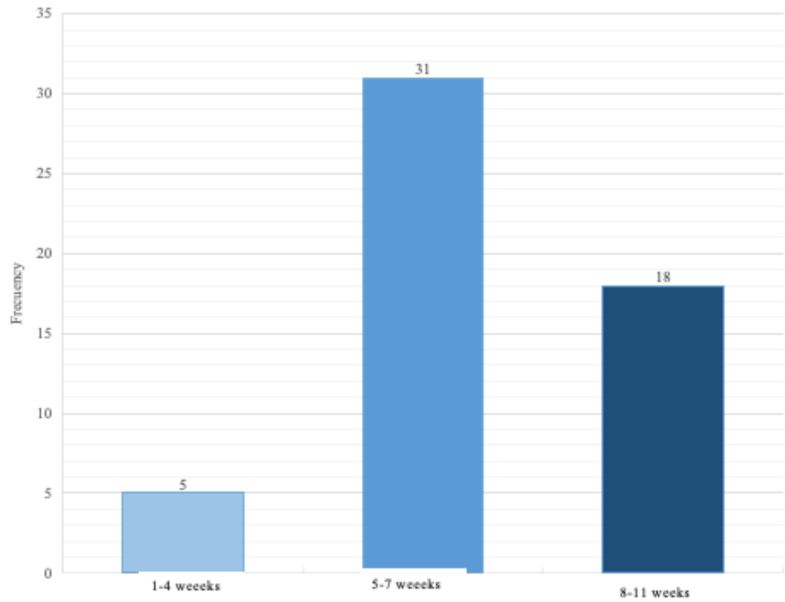


Figure 103. Bar chart of number of MOOCs number classified by 'number of weeks' factor.

Based on the graph in figure 103, we can see that most MOOCs had a course structure of 5–7 weeks. How did this affect student engagement rates?

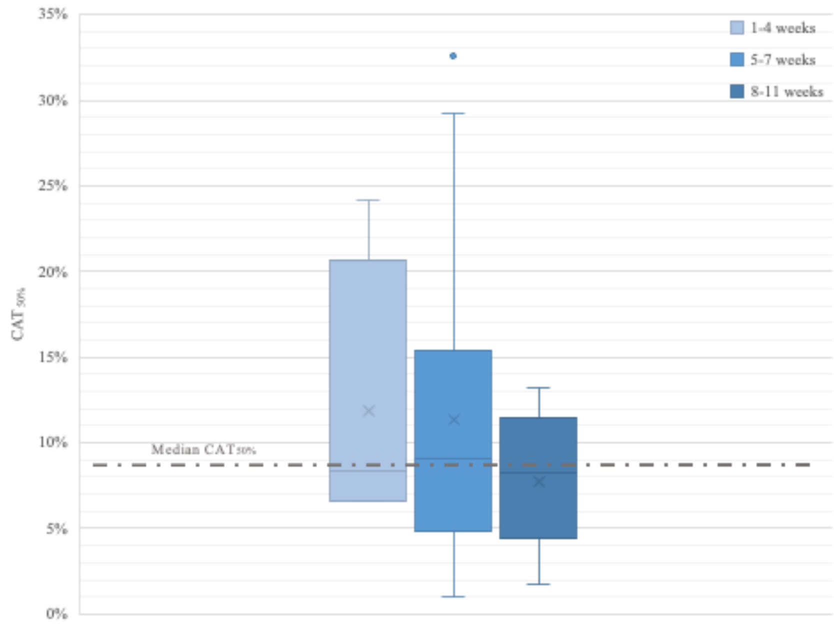


Figure 104. Box plot of ‘number of weeks’ factor.

This graph confirms that MOOCs following a programme of fewer than seven weeks reflected higher student engagement rates. When a MOOC followed a course structure that ran over more than eight weeks, the student participation rate was lower than in shorter courses.

d) 'Concept for content' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
CONCEPT FOR CONTENTS	How is the content structured (e.g., entry level – beginners, intermediate, advanced, novices, experts, units, modules, themes)? (P)	The structure of contents for beginners, intermediate and advanced learners.
	What media and presentation types of content are used? (P) (T)	Media types
	What are the sources of the content (e.g. re-use, self-development, contributions, external contracts, mixed approaches)? (P) (T)	i. Embedding supplementary course materials

Figure 105. 'Concept for content' process.

How is the content structured (e.g. entry level – beginners, intermediate, advanced, novices, experts, units, modules, themes)? (P)

This did not prove to be a significant factor in the monitoring process. The level of courses was filtered from the beginning. In other words, MOOCs were designed from conception to address a specific level of students.

In 'learning objectives process' in section II, the answer to this factor is discussed.

What media and presentation types of content are used? (P) (T)

i. Media types

In Zhu, Bonk and Sari's (2018: 217) study one can see that instructors provided with different types of media, which were also mentioned in the section I, chapter 4. 'Introduction to the pedagogical, technical, strategic and organizational factors to create a MOOC'. The most common types of media in MOOCs were: 78% of instructors used embedded video lectures in their courses, 74% included readings, 41% embedded PowerPoint presentation slides, and 34% included animations and other kind of dynamic or interactive contents. Furthermore, when instructors were asked which key factors they considered when they designed a MOOC, tools such as Facebook, Twitter or blogs were mentioned. Finally, the use of discussion forums and peer reviewed assessments were social media interactions that were included to encourage interaction and communication.

In the observed MOOCs I identified several media resources such as lecture videos, presentations, PowerPoint presentations, pdf documents, audio clips, discussion forums, websites, resources, and Twitter or instructors' blogs where students were addressed. Instructors' preferred tools to broadcast contents were instructional videos and discussion forums. Videos help students to understand contents while at the same time they are being entertained, and discussion forums are a tool that teaches students to become critical and reflective beings. Thus, the dynamics of courses were developed mainly with these two media types.

What are the sources of the content (e.g. re-use, self-development, contributions, external contracts, mixed approaches)? (P) (T)

i. Embedding supplementary course materials

In all the sampled MOOCs, contents were developed by instructors themselves. Instructional videos, readings, PowerPoint presentations and other slides were included in the course and these were produced by the instructors themselves.

Sometimes instructors directed to students to sources such as YouTube, scientific magazine articles, academic blogs, or websites relating to the particular discipline. Thus, embedding supplementary course materials is a common and useful practice in MOOCs, and complemented the contents.

e) 'Concept for learning activities' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
CONCEPT FOR LEARNING ACTIVITIES	What individual, peer and group activities are included (e.g. self-test quizzes, peer-reviewed activities, small group case study)? (P)	self-test quizzes, peer-reviewed activities, small group case study
	How can learners monitor their learning progress (e.g. progress bar, weekly generated feedback or checklist)? (P)	i. Students must be able to see clearly where they are with respect to the entire course

Figure 106. 'Concept for learning activities' process.

What individual, peer and group activities are included (e.g. self-test quizzes, peer-reviewed activities, small group case study)? (P)

In the analysis of the MOOCs I found the following factors related to this process, included in a bid to foster student engagement.

1) Individual activities. Activities such as instructional videos and self-test quizzes were most common in all sections of all MOOCs. These were essential in developing the contents of the course.

2) Group activities. Not all MOOCs included peer-reviewed activities. I was interested in whether this had an impact on student participation rates, and in how many MOOCs relied on this type of activity.

Classification of findings:

(1): Peer-review, peer assessment

(2): No peer-review, no peer assessment

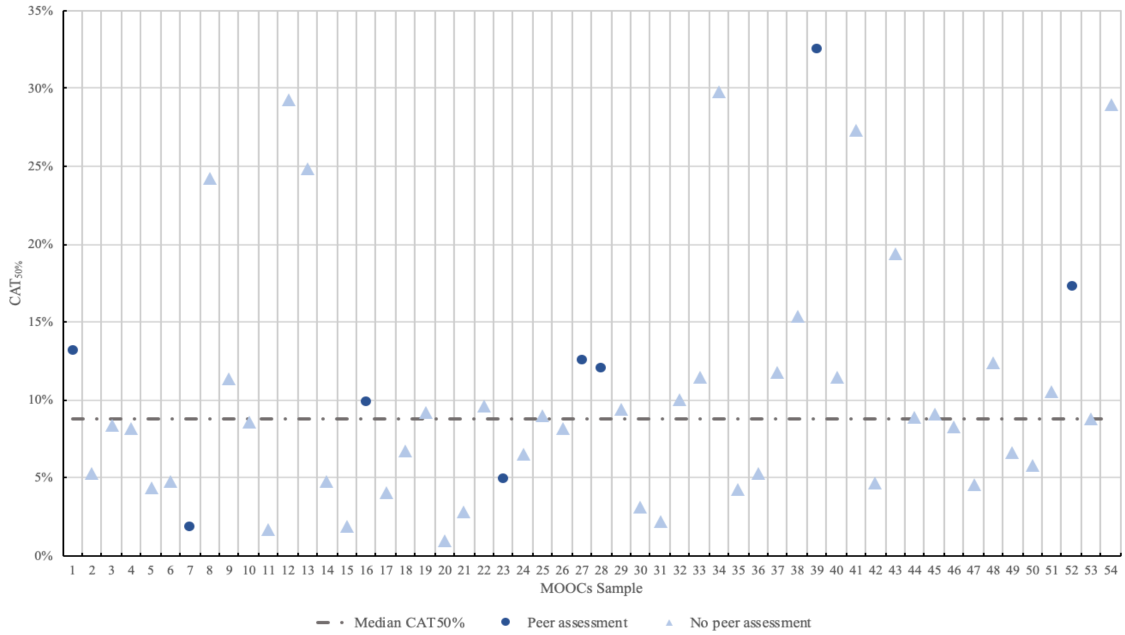


Figure 107. Distribution of $CAT_{50\%}$ per MOOC classified by ‘peer-assessment’ factor.

The graph makes it clear that despite ‘peer-assessment’ being a recommended activity for MOOCs to keep students engaged in the course, this method was not found in many of the MOOCs. In other words, it was not a method commonly used by instructors.

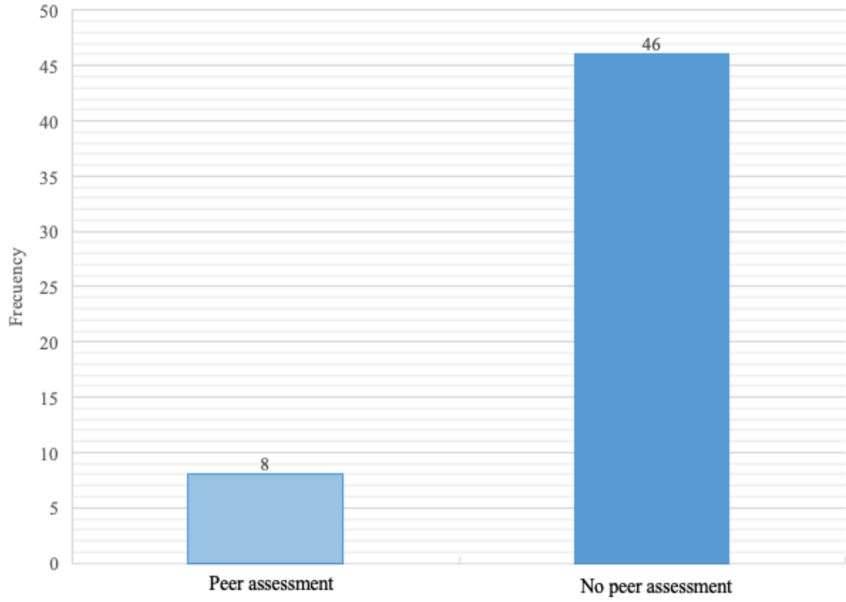


Figure 108. Bar chart of MOOCs number classified by 'peer assessment' factor.

The bar chart demonstrates that 85% of the MOOCs in the sample did not include peer-assessment activities in their curricula. I investigated how this affected student engagement rates.

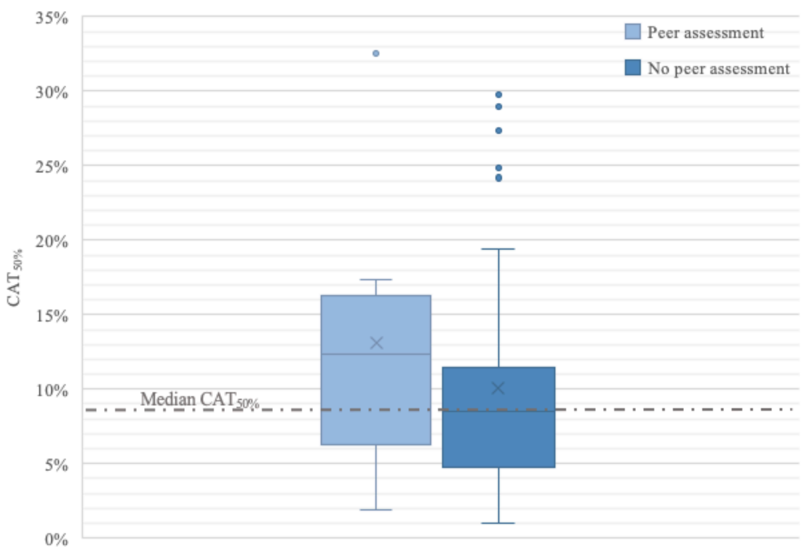


Figure 109. Box plot of 'peer assessment' factor.

In spite of the fact that the number of courses using peer activities was much smaller than the number of MOOCs that did not include this type of assessment, it was clear that there was a higher rate of student participation in courses offering peer-activities. Therefore, one could assume that peer activities promoted student engagement.

How can learners monitor their learning progress (e.g. progress bar, weekly generated feedback or checklist)? (P)

i. **Students must be able to see clearly where they are with respect to the entire course**

In the observed MOOCs on the two platforms both instructors and students could determine at any time the stage at which they were at. This is a basic tool that platforms offered to both institutions and students. Students were provided with a progress bar or a percentage of course completion. As far as the instructors were concerned, they could use this tool to extract statistics related to the development of the MOOC.

f) 'Technical concept' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
TECHNICAL CONCEPT	What kind of technical support will be offered to staff and learners? (P) (T) (S)	i. An explanation of the e-skills required to complete the course. Which e-skills are needed?
		ii. Demo-course: How to navigate through the course.
		iii. Bookmark (any courseware page)
		iv. Updates (if there are any)

Figure 110. 'Technical concept' process.

What kind of technical support will be offered to staff and learners? (P) (T) (S)

i. An explanation of the e-skills required to complete the course. Which e-skills are needed?

In the observed MOOCs I found only a few specific courses that provided an explanation of the running of the course. These were mostly MOOCs dealing with 'computer and communication sciences', in which students were required to carry out computer programming activities.

ii. Demo-course: How to navigate through the course

With reference to this factor, more information on demo-courses is provided above in section II, chapter 1, (1.4.1.4.1). 'Phases and processes implicated in the design of MOOCs', f) 'technical concept' process, (ii). 'Demo-course: How to navigate through the course'.

iii. Bookmark (any courseware page)

This is a useful tool developed in edX, which allows students to bookmark a place, site, article or reading. More information on the bookmark factor is provided above in section II, chapter 1, (1.4.1.4.1). 'Phases and processes implicated in the design of MOOCs', f) 'technical concept' process, (iii). 'Bookmark'.

iv. Updates (if there are any)

Updates is a tool that enables communications among instructors and students, where the latter can find information at the top of the course page, particularly welcome messages that provide orienting information to help them to pass the course. There is more information above on this factor in section II, chapter 1, (1.4.1.4.1), f) 'technical process', (iv). 'Updates (if there are any)'.

g) 'Media design' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
MEDIA DESIGN	Which types of media will be used (e.g. video lectures, digital text, animations, simulations)? (P) (T)	i. Are there multimedia tools such as videos, audio clips or images?
	Which media concept will be followed (e.g. interactive media)? (P) (T)	

Figure 111. 'Media design' process.

Which types of media will be used (e.g. video lectures, digital text, animations, simulations)? (P) (T)

i. Are there multimedia tools such as videos, audio clips or images?

The ‘media design’ concept is developed above in section II, chapter 1, (1.4.1.4.1), g) ‘Media design’ process. There were four types of tools that promote student engagement. Now, I am going to approach to the third and fourth option. The presence of interactive materials (self-quizzes, assignments/tasks, computer-graded questions, interactive surveys, and peer-assessment) are essential elements of a MOOC. Furthermore, interactive tools such as videos, images and audios should be linked to a set of questions. These are the connecting thread and the basis on which the course is developed.

The use of media was common in all the observed MOOCs. I identified that video-lectures were the tool most used by instructors to teach students the contents. In addition, there were PowerPoint presentations, digital texts and images. Self-quizzes are the most common tool linked to these media, encouraging students to reflect on what they had watched in the videos. Most observed MOOCs were approached and developed with the use of multimedia resources.

Which media concept will be followed (e.g. interactive media)? (P) (T)

In Zhu, Bonk and Sari's (2018: 218) paper, 29 of the total of 143 instructors used social media such as Facebook and Twitter in their MOOCs. The findings of the study were that 21% of instructors were in touch with their students through social media connections.

Findings from the monitoring process were that social media such as Twitter and specific blogs were used in the teaching of the discussed topic. I found some reference to them in some of the MOOCs.

h) 'Communication concept' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
COMMUNICATION CONCEPTS	Which communication concept will be followed? (P) (T)	i. A welcoming lecture video by teaching staff
	Are there other strategies to encourage learners to enrol in the course, such as strategies to make the course more engaging for students? (P) (T) (S)	i. Rating by users, the number of ratings and the number of reviews of the course
		ii. View of number of students already enrolled

Figure 112. 'Communication concept' process.

Which communication concept will be followed? (P) (T)

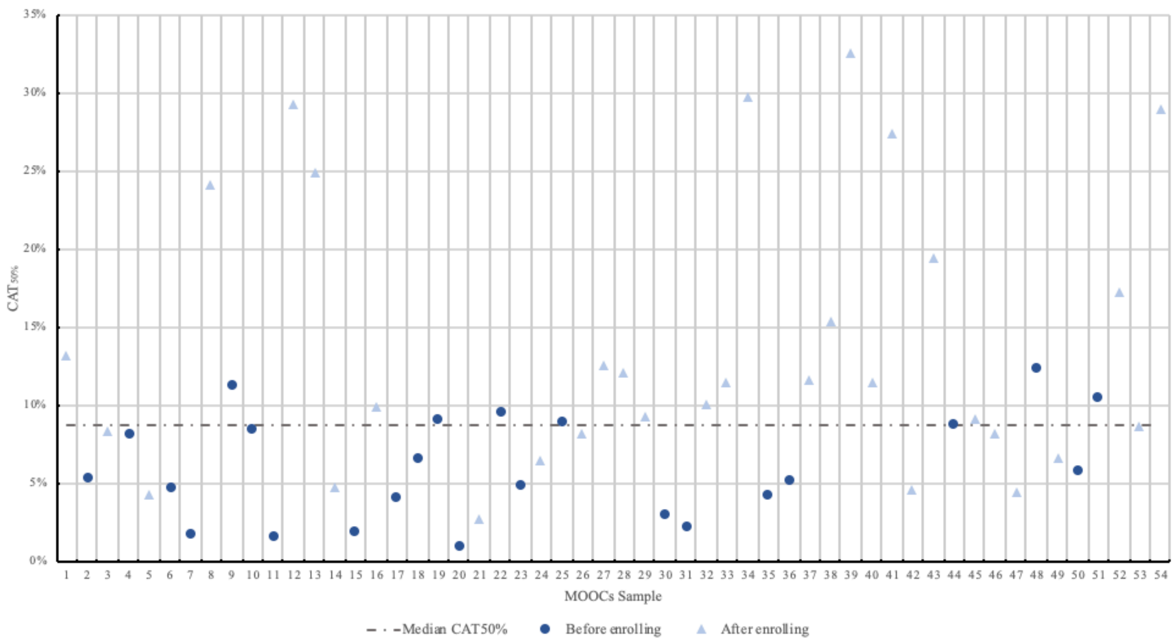
i. A welcoming lecture video by teaching staff

Is there a teaser, a short introductory advertisement for the MOOC that encourages students to enrol in the course? In the observed MOOCs, I found that almost all of them had a welcoming video performed by academic staff.

Classification of findings are as follows:

(0): A welcoming video before enrolling in the course.

(1): A welcoming video after enrolling in the course.



Distribution of $CAT_{50\%}$ per MOOC classified by ‘welcoming video’ factor.

The graph reflects a balance between finding a teaser before enrolling in the course, and after enrolling. This may tie in with the philosophy and the running of the platform. In the first variable, the platform used a teaser before students enrolled as a marketing strategy to attract students.

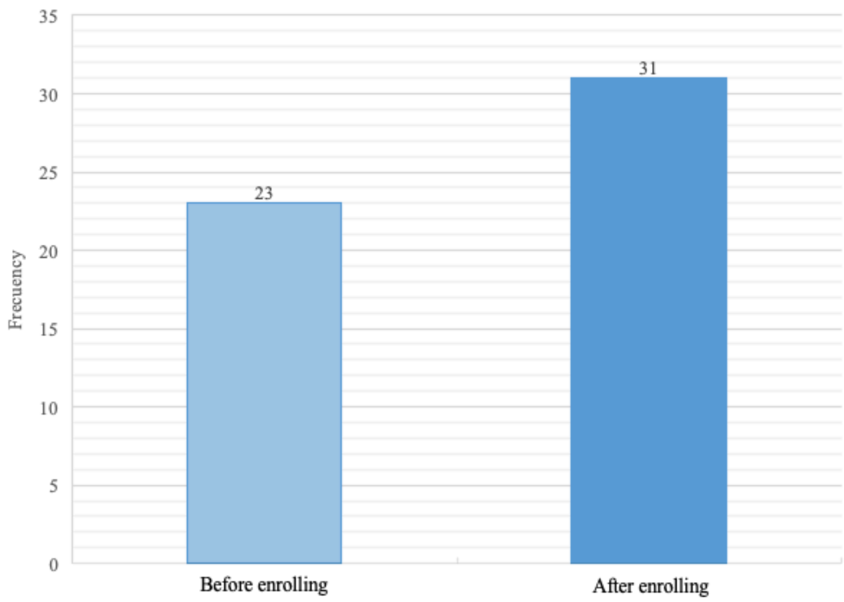


Figure 113. Bar chart of number of MOOCs classified by ‘welcoming video’ factor.

The balance is confirmed in this bar chart. As mentioned above, this seems to be in line with the platform and the specific configuration characteristics that it offers. I assessed whether this had an impact on student engagement rates.

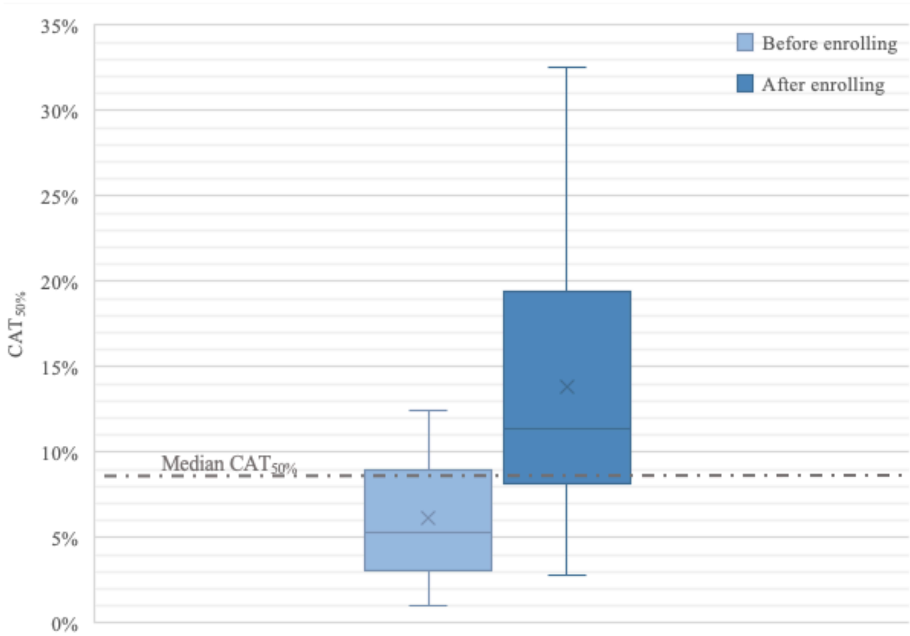


Figure 114. Box plot of ‘welcoming video’ factor.

The graph indicates that the fact of offering a welcoming video for students before enrolling in a MOOC does not have an impact on student engagement. On the other hand, it might work in the case of the second variable. Nevertheless, other factors are more powerful and more meaningful in keeping student participation high. This marketing strategy may work at the beginning of a course to attract more students, but student participation is not ensured by including this factor. Thus, a student does not face any limitations by enrolling in a course knowing only the curriculum, despite not finding an interactive tool that welcomes the student and explains the contents.

Are there other strategies to encourage learners to enrol in the course? Any strategies to make the course more engaging for students? (P) (T) (S)

The following strategies to encourage learners to enrol in a MOOC are discussed below:

i. Rating by users, the number of ratings and the number of reviews of the course

Is the fact that a course appeals to students, a guarantee that the rate of student engagement in the course will be high?

Classification of findings:

(0) There is no information about the rating by users, the number of ratings and the number of reviews of the course.

(1) One or more of these data are provided: the rating by users, the number of ratings and the number of reviews of the course.

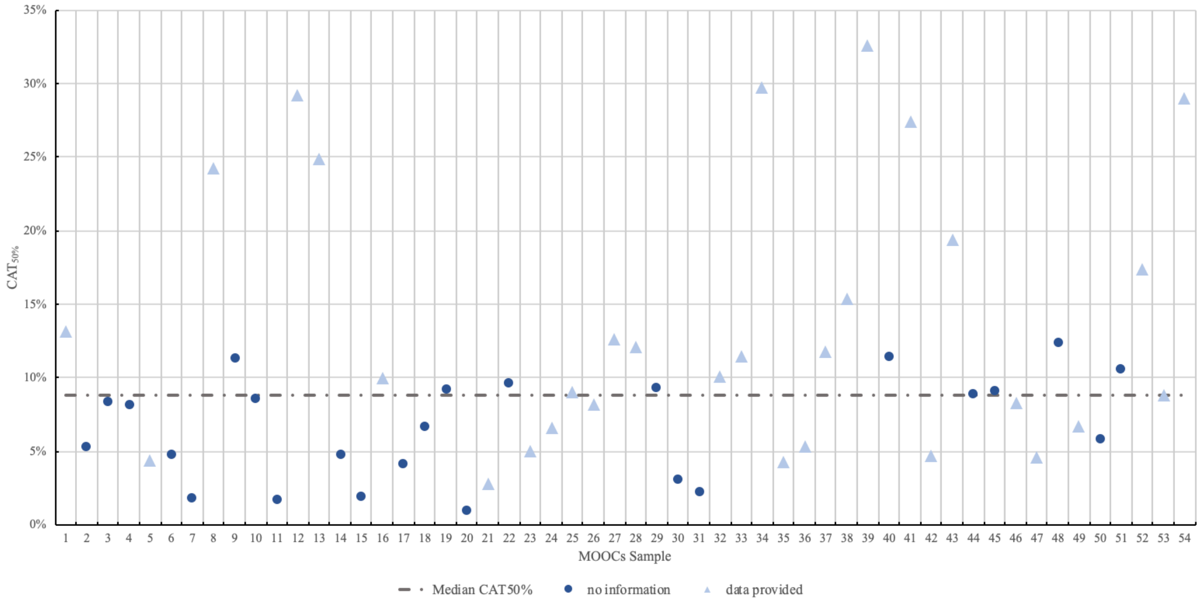


Figure 115. Distribution of $CAT_{50\%}$ per MOOC classified by 'marketing information' factor.

These types of data were found in some of courses. This may match the provider/platform.

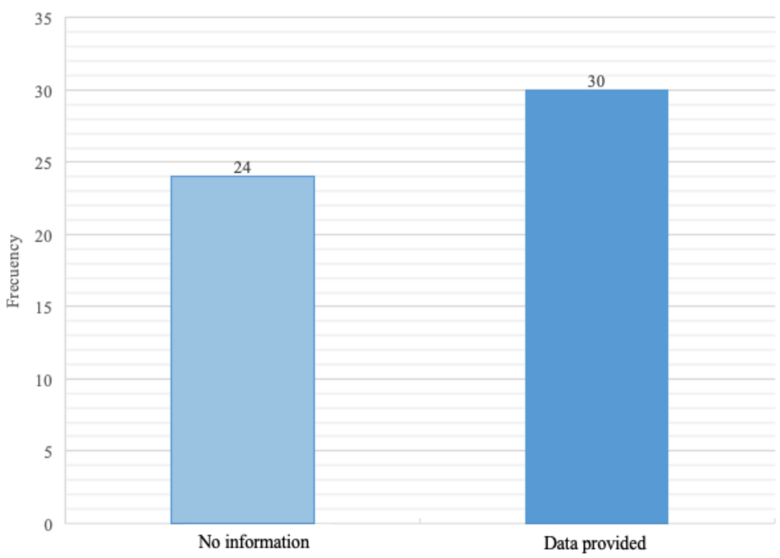


Figure 116. Bar chart of MOOCs number classified by 'marketing information' factor.

This bar chart confirms that this information was only available for half the courses.

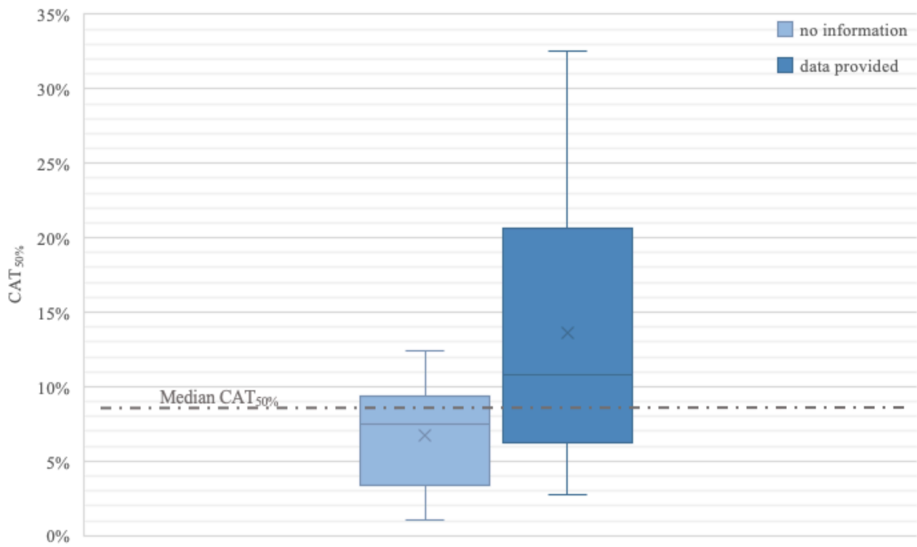


Figure 117. Box plot of ‘marketing information’ factor.

Data such as the rating by users of the course, the number of ratings or the number of reviews of the course in a MOOC, were displayed as a marketing strategy. From the bar chart, one can see that this had an impact on student engagement. Thus, this marketing tool worked effectively. The rating of users was a reference point for prospective users: (1) encouraging them to enrol in a course, and (2) indicating that rate of student engagement is very high. In other words, this MOOC would meet students’ needs.

ii. View of number of students already enrolled

This marketing strategy is used by platforms to make potential learners aware of how many students are already interested in enrolling in the course. The findings are discussed below.

Classification of findings:

(0) No information

(1) From 1–5,000 students (<5K)

(2) From 5,001–10,000 students (>5K and <10K)

(3) From 10,001–20,000 students (>10K and <20K)

(4) From 20,001–30,000 students (>20K and <30K)

(5) More than 30,000 students (>30K)

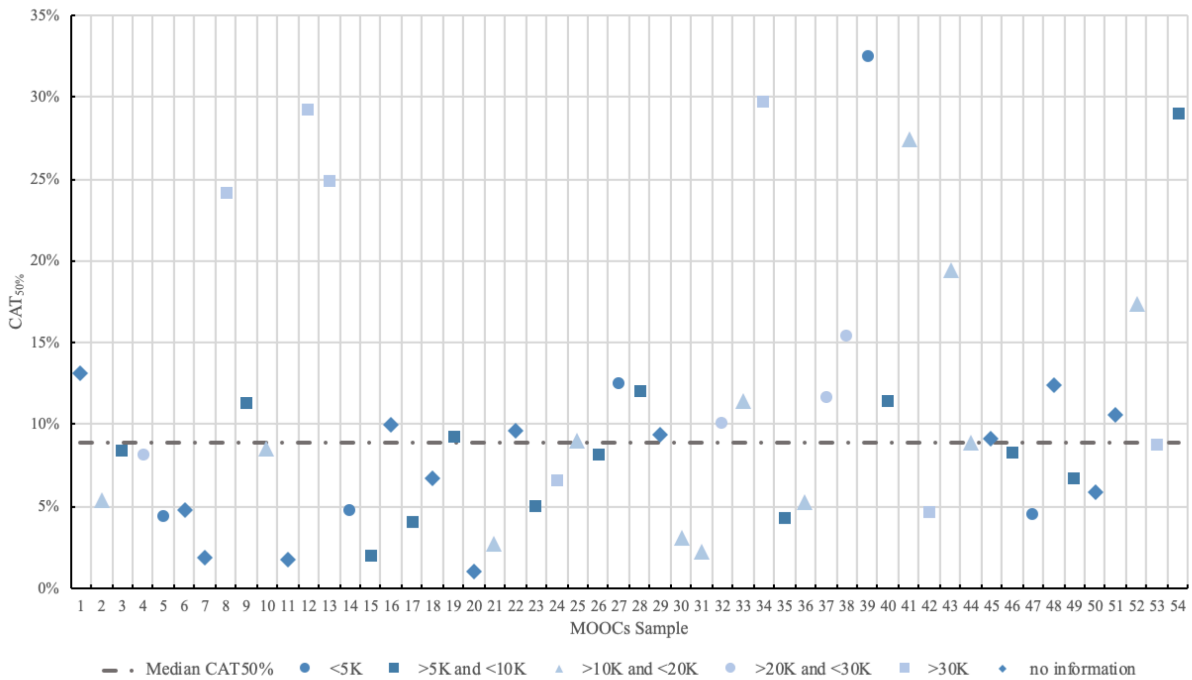


Figure 118. Distribution of $CAT_{50\%}$ per MOOC classified by 'enrolled number' factor.

There was a variety of MOOCs with very different numbers of students. Numbers grew over time from the beginning of the first release.

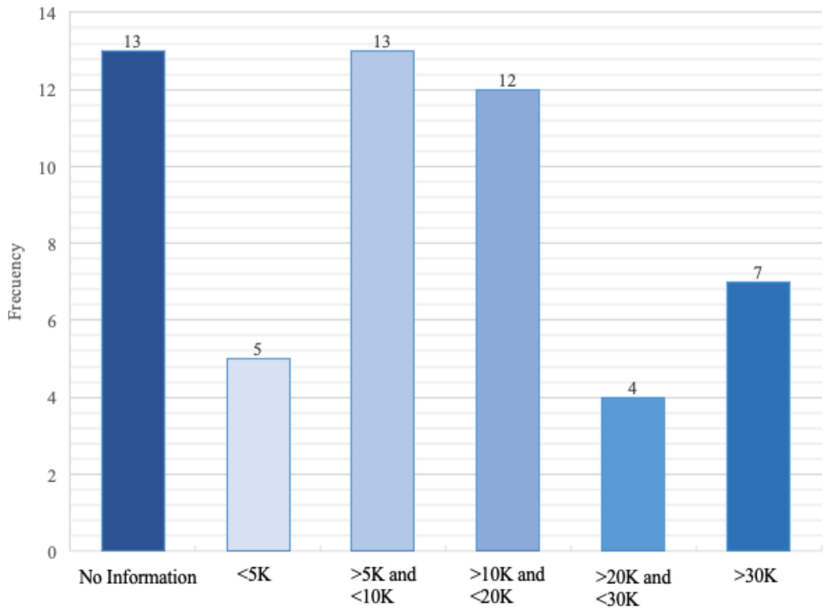


Figure 119. Bar chart of number of MOOCs classified by ‘enrolled number’ factor.

The bar chart shows a broad variety of data. As mentioned above, data were cumulative, including numbers from the beginning of the first launch of the MOOC.

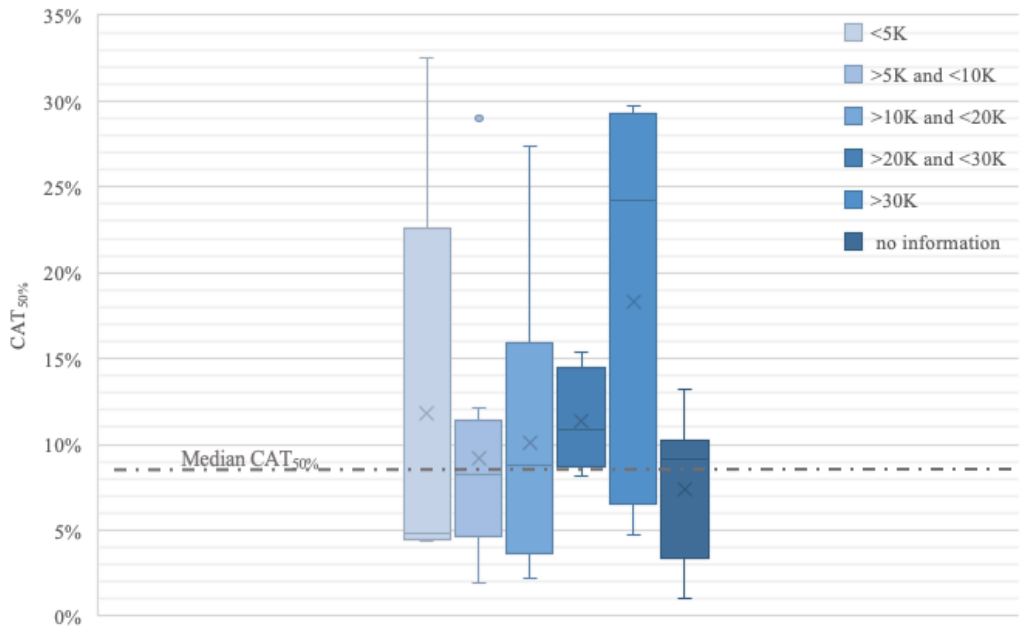


Figure 120. Box plot of 'enrolled number' factor.

Any marketing strategy that helps students to decide whether to enrol in a MOOC deserves be observed. One seemingly insignificant piece of information such as the number of enrolments in a MOOC, cumulative over time, could be decisive. The fight to the most viewed course among a wide range of specialised courses could be determined by small details that provide meaningful information to students.

It seems that a high number of enrolled students in a MOOC (cumulative data) is a guarantee of success. In this sample, despite the fact that the number of variable (5) 'More than 30,000 students' was only representative of seven courses, the median was very high. Thus, one can surmise that a high number of enrolled students is a sign that the MOOC is successful (recommended by previous students). In other words, this MOOC has high student participation rates.

i) 'Interaction concept' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
INTERACTION CONCEPT	Which types of interaction will be used? (P) (T)	i. Are there discussion boards and chat rooms?
		ii. Collaborative learning support?
		iii. Establishing study groups?

Figure 121. 'Interaction concept' process.

Which types of interaction will be used? (P) (T)

i. **Are there discussion boards and chat rooms?**

ii. **Collaborative learning support?**

iii. **Establishing study groups?**

As previously mentioned in the section 'media design' process, the following factors were used to encourage interaction and student engagement: discussion boards, chat rooms, browser-based communication tools, and interactive media were all strategies used to promote interaction among students in a MOOC.

In Zhu, Bonk and Sari's study (2018: 237), instructors were asked how peer interaction was encouraged in their MOOCs. Various options such as the following were used by instructors, and I observed these in my own study: peer activities, asynchronous discussion forums, and social media connections (e.g. Facebook, Twitter).

In the observation of courses, I identified discussion forums as the most used tool in creating a bond between students and academic staff and between students. They were used in the all MOOCs and were important to the understanding of the content provided in video-lectures. Chat rooms and other tools were not used in the observed MOOCs. In the sample of MOOCs, I observed that support for collaborative learning was provided only in some courses in the discussion forums proposed during the course and guided by the instructors. As I mentioned in the same part of section II, more reflection and management are required regarding this issue. Lastly, I could not discover the establishment of any study groups.

j) 'Feedback concept' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
FEEDBACK CONCEPT	What type of feedbacks will be given? (P) (T)	i. Types of feedback

Figure 122. 'Feedback concept' process.

What type of feedbacks will be given? (P) (T)

i. Types of feedback

In Zhu, Bonk and Sari's (2018: 219) study, 46% of instructors mentioned different strategies to engage students' interaction as important in MOOC design.

In the observed MOOCs, feedback was the tool used by most MOOC instructors to keep students connected and active during the learning experience, despite the distance. On the various platforms, feedback was provided at the end of each section of the course, through discussion forums, or just simply as a way of reflection, or as an approach to solving doubts. In addition, peer activity was used by instructors to encourage students to value other students' feedback as a form of reflection and knowledge-building.

k) 'Concept for tests and assessment' process

PROCESS	PROCEDURES COLLECTED FROM THE QRF	FACTORS TO STUDY
CONCEPT FOR TESTS AND ASSESSMENT	What concept for tests and assessments will be followed (e.g. formative assessment, summative assessment, authentic or work-integrated assessment, diagnostic assessment, criterion-referenced assessment)? (P) (T) (S)	Formative assessment
		Summative assessment
	How are the tests and assessments rated (e.g. grade system, scoring rubric system, point-system, reviews or comments)? (P (T)	i. Test rating scales: grade system, scoring rubric system, point- system, reviews or comments
	What is the range of assessment tools used (e.g. self-tests, quizzes, peer-reviewed assessments, small group collaboration)? (P) (T)	i. Assessment methods: self-tests, quizzes, peer-reviewed assessments, small group collaborations
	How do the learners receive their results from tests and assessments? (P) (T)	How learners get the results from tests and assessments

Figure 123. 'Concept for tests and assessment' process.

What concept for tests and assessments will be followed (e.g. formative assessment, summative assessment, authentic or work-integrated assessment, diagnostic assessment, criterion-referenced assessment)? (P) (T) (S)

As I mentioned in the section II, (1.4.1.4.1.), a) 'learning objectives', 'how are the learning objectives assessed?', (i). 'Evaluation of learning objectives', I observed that in practice, one could find both formative and summative assessment as a method to guide students' in-process evaluations in all MOOCs. As said, online training requires constant monitoring and tracking of students. I think that this is why the commonest method was formative assessment during the course. This was achieved by discussion forums, weekly quizzes, homework assignments, and surveys. In addition, many instructors used final projects, instructor-created exams, standardised tests and final grades, in other words, summative assessment.

How are the tests and assessments rated (e.g. grade system, scoring rubric system, point-system, reviews or comments)? (P) (T)

i. Test rating scales: grade system, scoring rubric system, point-system, reviews or comments

With reference to test rating scales, the scoring system was the method used in most MOOCs to assess the progress of students through quizzes. Several MOOCs also used a grade system when students desired a verified certificate. This was the chief difference found between MOOCs.

"Score" refers to a particular assignment, self-test quiz. “Grade” is used more when one refers to the general assessment of a course; in this case, students wanted to obtain a verified certificate.

What is the range of assessment tools used (e.g. self-tests, quizzes, peer-reviewed assessments, small group collaboration)? (P) (T)

i. Assessment methods: self-tests, quizzes, peer-reviewed assessments, small group collaborations

The assessment tool used most in the observed MOOCs to evaluate students' achievements of their learning objectives, is self-test quizzes with scoring/grading. They were used in both formative and summative assessment. The scoring option was the form that was used most. Quizzes were independent or embedded or in-video quizzes.

With reference to peer-reviewed assessments, this factor was similar to the identified factor in the 'concept for learning activities' process, procedure: 'what individual, peer and group activities are included'? (e.g. self-test quizzes, peer-reviewed activities, small group case study). The statistical assessment of this type of activity was developed in that section.

How do the learners receive their results from tests and assessments? (P) (T)

In my sample of MOOCs from both platforms, assessment responses related to submitted activities such as quizzes, programming assignments and exams were received by students in automated format. The two most common automated modes were: 1) independent quizzes carried out for students' performance evaluation, and 2) embedded or in-video quizzes that provided students with the opportunity to test their level of knowledge assimilation while they watched a video, without any grading. The only mode that was not automated was peer-reviewed activities.

Summary of section III. Results

In order to bring the empirical section to a close, I summarise the main points here: how this research study was conducted in practice, how the $CAT_{50\%}$ index was used in the fieldwork, how the statistical analysis was performed with the sample of courses, and the analysis of factors included in the design phase, from a quantitative and a qualitative perspective.

In the monitoring process, several factors were identified. The fact that the observation of the MOOC sample was carried out from the students' perspective provided me, on the one hand, with new insights that I did not find in previous studies. On the other hand, this highlighted the limitations caused by not having access to useful information from which more conclusions would have been possible.

Some pieces of information, also called factors, resulted in interesting findings for instructors to consider during the design phase of a MOOC. In other words, the instructional process should be comprehensive and detailed to ensure that the MOOC will achieve high rates of student participation.

In conclusion, the main aim of the project was to collect evidence on the most suitable factors that best encourage student engagement.

SECTION IV. CONCLUSIVE FRAMEWORK

Chapter 1. Discussion and conclusions

The following chapter is developed with the aim of contributing more information about this new essential tool, the MOOC. This is particularly important as there is a lack of knowledge about how to encourage student participation in MOOCs. This stage of the project has allowed me “to evaluate the quality of the instructional design, products, and processes” (Zhu, Bonk & Sari, 2018: 207). Because there is a gap in our knowledge about MOOCs with regard to the topic of this research study, I evaluated how student participation rates behaved when students enrolled in a MOOC. Thus, after the identification, categorisation and assessment of all the factors involved in the development of MOOCs, the aim was to identify which features of MOOCs facilitate student engagement.

The evaluation of the factors implemented in the sample of courses allowed me to identify:(1) which of these occurred, (2) how they were implemented, and (3) what benefits these features had for learners.

1.1 Discussion of research outcomes

This chapter is set out according to the specific objectives identified in section: introduction and justification for the research, (1.3). Research aims, (1.4) Research questions and (1.5). Specific objectives. In addition to the gaps in the literature in (1.2). Objectives of section II, the theoretical framework, and the results.

1.1.1 Main features of MOOCs

Specific research objective: Analyse MOOCs in order to define design outlines.

Despite the fact that currently MOOCs have become an essential tool for students during the year 2020, when people were forced to maintain social distance, there are still people who do not know what MOOCs are, particularly those who are not familiar with student life. Thus, in spite of MOOCs having experienced an exponential growth in student enrolments, they are still fairly unknown to those from professional backgrounds who want to enhance their careers.

As mentioned above in (2.2.1.1). 'The impact of MOOCs on education' of section I, universities are now really interested in investing and expanding their online offerings, and MOOCs are the clear winner in this regard. Universities are increasingly actively involved in including this kind of training in their official offerings, designing, developing, tracking and evaluating MOOCs. A recommendation is that institutions could perhaps provide general guidelines on MOOCs, giving them an official nature to encourage university students, and running advertising campaigns for students interested in engaging in lifelong learning.

With reference to the definition of MOOCs, and the difference between cMOOCs (which are based on the construction of knowledge) and xMOOCs (based on providing course contents and resources), after observing and tracking the sample of MOOCs, I believe that this distinction should not be applied too strictly. I have seen that MOOCs lean more towards xMOOCs, in which students have the opportunity to construct knowledge through discussion forums, peer-activities and, in some cases, new practices of co-design between academic staff and students. Thus, MOOCs are currently a mix of both models, as academic staff are able to implement this new way of constructing knowledge on which cMOOCs are based while at the same time managing the large number of students enrolled in the course, framed in a model of xMOOC. For this reason, and according to the active learning pyramid depicted in (3.3.2.1). How students learn? of section I, the proposed and more effective activities should foster actions such as 'say, write and do'. In other words, actions such as analysis, definition, creation and evaluation, should be encouraged in order for students to reach their learning outcomes. In other words, more effective interactive teaching is a guarantee of deeper learning.

With regard to the role of instructors, I believe that their role is essential to keep students hooked into the MOOC. Guidance, support, tutoring, communication, feedback and tracking students during the course are meaningful roles in keeping high student participation rates. Despite the presence of automated strategies for assessment to facilitate students' advancement in their learning experience, I defend the idea that tutors should be constantly present and available for students. Therefore, it is essential that there are other strategies for assessment that foster students' reflection, such as discussion forums, peer assessment, writing activities or midterm evaluations. The goal is to provide constant feedback to students.

As for the democratisation of education, MOOCs were created to reach potential students with few resources and offer a free option. Thus, on both platforms one can currently find financial aid and assistance for students. In addition, MOOCs have become the best way to access universities that were previously out of reach of many students, for reasons of distance, monetary issues or accessibility problems. Currently, students have the opportunity to access almost any university in the world that offers MOOCs.

With reference to the skills students require to complete a MOOC, institutions should consider offering competences in self-learning and digital skills in their training when academic staff design a MOOC. Observing MOOCs in this study, I identified that courses with a high level of participation were those where students were often very familiar with ICT. The area of self-learning is so broad that it could not be covered in this research. I focused on what the platforms and instructors could offer rather than on the competences that students needed to maintain a high level of participation in a MOOC.

MOOC's instructional design process – its detailed design and development – must be included in instructors'/supervisors' workload time. It should be viewed as part of the whole process of launching a MOOC. The preparation of media files such as recording videos and audios or creating automated quizzes is as much a part of the course as the teaching of the course. The resulting success or failure of a MOOC is largely dependent upon this preparation. The problem is that institutions and universities do not consider MOOCs to be a regular or traditional form of training. Thus, MOOC design is considered as extra time that instructors/supervisors invest in addition to their workload. This could result in bad outcomes for student participation, in cases where the MOOC is not properly designed. Institutions, platforms and universities should include the design of MOOCs in a teacher's workload and support them in the design process.

> Most faculty members find that they devote a significant amount of time – often more than expected – into the development and delivery of a MOOC.

> Some faculty estimate this commitment at about 150–200 hours over the MOOC development timeline. It is suggested that faculty members developing a MOOC set aside ample time for the development process. (Northwestern University, n.d.)

In a bid to propose a solution, institutions/universities should reflect on how to include this meaningful aspect of launching a successful MOOC. MOOC design should be a process included in instructors' workload, just as tutoring or mentoring is during an ongoing MOOC. Institutions/universities should find strategies to include these costs. Despite the fact that this might be contrary to the MOOC philosophy, these costs could also be built into the tuition fees as a way to implement continuous improvement processes. The special nature of MOOCs that are constantly evolving is the most compelling argument for seriously considering this factor. In addition, institutions/universities are increasingly focusing on creating departments that include technical experts and those with expertise in MOOCs who can help other instructors to create MOOCs.

To bring this section to a close, it is important to highlight that each institution/university should provide instructors whose mission is to launch a MOOC with the necessary tools, means, and information to do so. Sources and resources should be available to instructors in order to facilitate the creation process of a MOOC.

1.1.2 Co-design of MOOCs in collaboration with academic staff and students

Specific research objective: Analyse the role of student participation in the design of the MOOC curriculum.

The concept of students as co-creators of learning methods, course design, and curricula was discussed in (3.2.1). Three types of student participation in pedagogical planning of section I. Various examples showed how students felt engaged in the course, and how their participation was key to maintaining or even improving both the effectiveness and the quality of teaching and learning in a course. Davis and Sumara (2002, quoted in Bovill, Cook-Sather & Felten, 2011: 6): "'We're all learning through engagement with the subject and each other.' These articulations of shared commitment and collaborative efforts attest to the power of positioning students as co-creators of learning". However, in spite of the hopeful notes in the literature, the reality is that although MOOCs in the past emerged with a more connectivist approach (Brown et al., 2012: 13) through exchange (Brown et al., 2012: 108), communication, collaboration and cooperation (Brown et al., 2012: 61), I believe that most MOOCs are courses that, although encouraging student participation and placing students at the centre of the learning experience, do not as a rule encourage student participation in the process of creation of their curricula. MOOCs are a site where knowledge can be built through collaboration and cooperation, but this does not generally go much further. Thus, good practices related to the student co-creation in MOOCs are still scarce.

Thus, I found that co-design of MOOCs is not current practice. Drawing conclusions only from these two case studies on the co-design in MOOCs, developed in (1.1). MOOCs co-design of section III, is not possible. This is a consequence of dealing with a very innovative field such as MOOCs, where the implementation of co-design poses a challenge, as does the existence of a confidentiality agreement on the part of the institutions. Thus, I cannot assume the existence of a direct relationship between the benefits of MOOC co-design and the level of student participation. In this context, the most convenient action would be to go a step further on this topic within a specific institution or university itself. Although conducting this study as independent researcher has resulted in some of interesting findings, these are not enough to reach a definite conclusion. At the very least, this has created of the opportunity for debate.

In both good practices described in the previous section III, (1.1), students were involved in MOOC creation in the following ways: course design, content creation and technical scoping of interactive assets. Thus, turning to the ladder of student participation in curriculum design (Bovill & Bulley, 2011: 5 -6), students participated actively according to a seventh rung (see section 3.3.1.3) of the Arnstein' ladder (1969: 216). The results of these good practices were the following benefits: (i) the identification of what worked better and what engaged students more, (ii) the adaptation and enhancement of teaching practice to better meet students' needs, (iii) an increase in students' sense of commitment and responsibility, resulting in more effective learning, and (iv) new knowledge about technical resources building rich, diverse, interesting and appealing contents for MOOC students. Therefore, these findings suggest that student participation in curriculum design, according to the literature, can help to ensure a high level of participation in a course. However, and as previously mentioned, this statement cannot be confirmed conclusively owing to the lack of examples.

When one talks about co-designing one can extract the following ideas. The engagement of students who participate in the MOOC design process makes them feel more satisfied, encouraged and committed to a course team. CGHE practice found that tutors confirmed a transformation in their trainees' practice by tracking their engagement, quizzes, and the use of multimedia tools. Furthermore, "a corporate trainer […] recommended his 200 staff to [perform] the MOOC and they are currently using many of the tools and techniques from the courses in their [own] training" (Kennedy & Laurillard, 2019b: 16). The evidence from sharing, mentoring and institutional change shows that instructors have gained more new knowledge assets, useful tips and resources, and this has made them feel more confident about using new technology. Finally, the value creation cycles imply a more meaningful and conclusive impact on learning, and a strengthening of the bond between instructors and students, providing instructors with more data, advice and insights to apply, perform and enhance their practice. Thus, in this case we can also confirm that student participation in curriculum design has benefits for both instructors and students; in other words, for the whole learning experience.

The fact that students provide their technical savvy and viewpoints on content may make the MOOC more appealing and interesting to other potential students. Future learners look for references from other students when they search for a MOOC in which to enrol. The fact that technical skill and contents have this added value for students who have participated in the MOOC design process, might be a factor that gives ongoing students a greater sense of commitment and interest in the course. As above mentioned in the section III, (1.1). MOOCs co-design, researchers describe the creation of cycles of added value when co-design is used from the earliest stages of MOOC design. This created added value results in an increase in networking, the creation of knowledge capital (new assimilated abilities), the implementation of new practices, an enhancement of performance as result of co-working with stakeholders (the use of new learned tools), and a more critical and reflective attitude towards new learned abilities and tools. Therefore, and according to the literature, we can talk about more effective teaching and learning by instructors and students when the latter participate in curriculum design.

Finally, it can be inferred that there is a beneficial bond between student participation during a MOOC co-design process and a more enriching learning experience for both instructors and students. Deeper learning seems to be an advantageous outcome of teaching and learning in a MOOC.

1.1.3 Processes, procedures and factors more likely to encourage student engagement

Specific research objectives: (i) Identify and define the processes and procedures that are the most suitable in the design phase of MOOCs to encourage student participation, (ii) collect, identify and define the tools necessary for the creation and the update of MOOCs that promote student participation, and (iii) identify the factors that best encourage student engagement.

The added value of the project consists of helping institutions and supervisors/instructors to develop a MOOC by considering all the meaningful parts so that the quality of the course is assured. Quality assurance starts with a good MOOC design. The implementation of these factors creates better teaching, and with it more effective learning and a higher rate of student participation.

The more accurate a MOOC is in the inclusion of these factors in its design, the more students will feel that this is a high-quality course. Thus, they will feel more committed and involved in the course. And, consequently, student participation rates will be higher during the course. Furthermore, we should not forget that proper support from platform providers and universities is key to ensuring successful results from a MOOC.

The following is a description of the findings with relation to the factors implemented in the MOOCs sample. From this systematic and comprehensive classification, the most highly rated factors which worked best were identified.

- ‘Learning objectives’ process:

Learning objectives	
i.	Target audience of the MOOC. Student engagement was higher when a MOOC was aimed at ‘Bachelor’ and a ‘specific target audience’.
ii.	Prerequisites. There was no significant difference between the two options; that is whether the MOOC had or did not prerequisites.
iii.	Main aim of the course. One could say that an accurate definition of the main course aims provided by instructors was a decisive factor in encouraging student engagement.
iv.	Main objectives of the course. These were displayed at the beginning of the course. A quick overview of all the topics that would be developed during the course. The factor that worked best was to plan the MOOC per week and by type of activity. Planning by topics also worked well.
v.	Design of learning objectives each week after enrolling, during the course. It could be inferred that student engagement rates were higher when learning objectives were indicated by week. They were provided before each new lesson started. It was not relevant whether they were accurate or not.
vi.	Other ways to find the learning objectives - What you will learn. Finding the definition of competences students would attain if they completed the course was not found to be a relevant factor.
vii.	Skills you will gain. Describing the ‘skills that they will attain’ when students finish the course could be regarded as a meaningful factor that encouraged student engagement.
viii.	Course handouts. No relevant information.

The analysis of all the MOOCs from the two platforms showed that when learning objectives were systematically defined, students felt more comfortable and confident having a greater presence during the course. When the course was addressed to bachelor or specific courses offered by the university, students' participation rate was higher. We can also infer that master's students required more motivation to complete a course or perhaps MOOCs should adapt to better meet students' needs. On the subject of prerequisites, I believe that students make it very plain when they register for a course. They invest time in choosing the course that best suits their needs, regardless of whether the course has prerequisites. Thus, in this study the fact that a MOOC had prerequisites was not found to be a barrier to registering for a course. The main aim of the course was the factor on which students focused their attention. This provided a reliable, efficient and quality image of the MOOC and made students feel more confident about being able to complete it. The main objectives of a course were also a meaningful factor in that they gave students an overview of the course so that they could organise their learning experience by weeks. This allowed them to include it in their academic life. After enrolling in a MOOC and during the course, learning objectives to be reached every week were found to be very important. This is a basic guideline that encourages students to persevere throughout the course. However, it did not appear to be necessary to show students what they are going to learn in other ways such as in 'what you will learn' mode (this was not relevant information). Students wanted to know a MOOC's learning objectives. Instead, the skills students would have mastered when they completed their training appeared to be a factor of interest to students. It was clear that student participation was influenced by the presence of information about these skills in the MOOC. Finally, to bring this first procedure to a close, all the specifications that students regarded as related to their learning objectives might have influenced students' decision to enrol in a particular MOOC. Its specifications seemed to provide a MOOC with an image of quality that students valued, keeping them enrolled in the course.

Entry levels (e.g. beginners, intermediate, advanced, novice, experts)
i. Level of the course: introductory, intermediate, advanced. When the MOOC is aimed at the beginner and intermediate level this is regarded as a meaningful factor by students.

When MOOCs were addressed to a beginner or the intermediate level, student participation was higher than when the course was focused on the advanced student in the discipline. There could be two reasons for this: 1) This was a signal that the more advanced a discipline, the lower the number of students who would wish to attain this level, or 2) more research was required to identify why students decided to drop out in high numbers, either from uncertainty or no having no interest in completing the course. Perhaps these MOOCs did not meet students' needs. This led to further reflection. Would a MOOC in which students had more power during the learning experience at master's level work better?

Assessment of learning objectives (e.g. formative assessment, weekly quizzes, multiple-choice tests, delivery of a product, essay, final exam)
i. Evaluation of learning objectives: through weekly quizzes, multiple-choice tests, final examination. Formative assessment was the preferred method among instructors. Constant assessment throughout the course was found to have a more positive impact on students than a final assessment. Thus, the method of learning

	assessment most used was quizzes, peer assessment, and automated grading of multiple-choice questions.

The assessment instruments used in most cases were quizzes, discussion forums, peer assessment and multiple-choice questions within a formative assessment framework. Assignments, tasks and final examinations were found to a much lesser extent. In this regard, this reinforced what was found in the literature where for instance, Yale, Poorvu Center for Teaching and Learning, (n.d.) found that formative assessment was the preferred methodology of instructors as teaching-learning was more effective (in terms of student participation), considering the high numbers of students enrolled in MOOCs. As far as relating final examinations as strategy to knowledge area or to course length was concerned, I did not find any direct relation between these two factors. With regard to discussion forums, I found that rather than an assessment instrument, discussion forums were considered as a tool to attain three goals: (1) to create a bond between students, and between academic staff and students, (2) to keep students engaged and active during the course, and (3) to develop strategies such as peer assessment. This latter is a learning strategy that is discussed in the following sections, the 'concept for learning activities' process and the 'feedback concept' process. To conclude, discussion forums had a presence in all the analysed MOOCs. They were regarded as one of the most essential strategies of formative assessment.

- ‘Organisational concept and roles’ process:

MOOC timeline
i. Course length. MOOCs that worked best were those that had a course length of fewer than 40 hours.

According to the results and similar to what was found in the literature, such as in the article published by Northwestern University (n.d.) and Burrus et al. (2014: 7), student engagement was high when a MOOC has a maximum length of 40 hours. The suggestion in the literature in order that students gain the benefits during the learning process without feeling overwhelmed is that a course should be about eight weeks in duration. In my sample I observed that courses of around 40 hours had a duration of between seven and eight weeks. Thus, the ideal workload for students would be around five hours a week. I also responded to these statements, from a different perspective, in the section on workload/week and number of weeks to determine whether this was in line with the reviewed literature.

Openness and free access guaranteed
i. Language: English. Language was not a relevant factor as far as encouraging student engagement was concerned. This suggests that language was not a limitation for students who wanted to register for a course. However, language was a factor that motivated students to participate in a course.

ii.	Transcriptions of videos: English, Spanish, Chinese. The trend was to provide video lectures in English as well as other languages. The transcription of videos into different languages is a meaningful factor for students.
iii.	Free course. This was a relevant factor that encouraged student participation. One could say that free MOOCs were more successful than those with tuition fees. MOOCs are still in an early stage of development as official training. Institutions should consider this factor; MOOCs could also form part of official training in degrees curricula.
iv.	Providing a verified certificate at an affordable fee. The availability of a verified certificate was found to be essential in appealing to prospective students of a MOOC. This was a key factor in maintaining high completion rates.
v.	Upgrade to verified at any time during the course. An interesting marketing strategy that would prevent tuition fees from becoming a barrier to enrolling in a course.
vi.	Which institution? University. Despite more research being necessary, I inferred that this factor would lead us to reflect that students were interested in knowing to which university the MOOC belonged.
vii.	Is financial aid available? This was a meaningful factor and one that made a further step towards the democratisation of education. MOOCs should maintain it over time.
viii.	Meet the instructors. A significant factor was instructor accessibility. A constant connection with students made them feel involved and committed to the learning process.
ix.	Issue: Hard sciences or soft sciences? MOOCs that worked best were those which catered for students with digital skills (Computer and Communication

> Sciences and Aquatic Science and Technology). I inferred that students from other academic areas would need more training in ICT to perform well in these MOOCs. One solution would be to include such training as a compulsory course in their official degrees.

Language was not a barrier for students registering for a MOOC. Numbers showed that student engagement was as high when the course was performed in English as when it was in a local language. However, when the course was provided in English, this could be regarded as a motivation for them. In my view, the fact that MOOCs were in English, was an opportunity for students to improve their communication skills, beside simply completing the specific course for which they had registered. Thus, in the case of the ‘transcription of videos’ factor, I observed that language did not pose to be a barrier in MOOCs that had transcribed videos into two or more languages. In such cases, student engagement is very high. Therefore, the fact of engaging in training in a language other than the mother tongue, such as English, was a motivation for students. With regard to the ‘free course’ factor, results showed that student participation was higher when there were no tuition fees attached to accessing a MOOC. However, the fact that this difference was not very great, suggest that students would be willing to pay tuition fees if they were compulsory to receive specific training. Thus, it could be inferred that paying affordable tuition fees would mean that MOOCs were an appropriate choice for integration in official training. However, the option of MOOCs as an alternative type of education, parallel to more recognised teaching (compulsory education) should be kept alive over time. Achieving verified certification when a student completes a MOOC is, in my opinion, a significant step forward in the area of MOOCs, becoming this a meaningful tool. As a reminder of the literature, in Zhu, Bonk and Sari (2018: 216), the authors note that providing a certificate was one of the first reasons for students enrolling in a MOOC. Thus, the receipt of a verified certificate that students can include in their academic profile is undoubtedly a must in for any educational offering. Students have the option to upgrade to attain this verified certificate at any time during the course. Thus, this marketing strategy allows students time to decide, in a bid to keep them engaged in the course. In addition, the institution that is offering the MOOC is an important factor that students consider, as has been found in other studies (Shah, 2019c). The fact that financial aid is available to learners who cannot afford to pay high tuition fees is important and should be maintained over time. MOOCs have become a tool that is used as a benchmark in the democratisation of education. In addition, ‘meet the instructors’ is considered an essential factor by students. Hew (2015: 320) and Zhu, Bonk and Sari (2018:222-223) argue that maintaining a bond between instructors and students have benefits for both parties. On one hand, students feel more involved and committed to the learning process, and on the other instructors can better identify how to approach and to meet students’ competencies and needs. Thus, it is important that students receive a welcome from instructors at the beginning of the course. This is the first step to making students feel closer to their instructors, and thus, making communication with tutors easier. Finally, with regard to the ‘Issue: Hard sciences or soft sciences’ factor, in this research study I analysed only MOOCs that were from the area of the hard sciences. Within this framework, I found that those disciplines that integrated digital skills as the basis of their MOOCs achieved higher student engagement rates. This could be a sign that students from other disciplines would need to include more digital skills in their profile.

- 'Didactic concept and methods' process:

Type of didactic principle (e.g. self-directed learning, direct instruction, reflective learning, collaborative learning, emotional learning)
i. SDL (Self-directed learning), direct instruction, reflective learning, collaborative learning. SDL is a factor that should be considered by academic staff as one of the skills that students should have to complete a course, because of the features of MOOCs. With regard to direct instruction (leading students during the learning process) and constructivist methods (discussion forums and peer activities), instructors use both methods throughout their courses. Discussion forums and peer activities teach students to be more reflective and critical. Finally, with regard to the fact of cultural issues, I did not find any significant results. This may be a sensitive issue that instructors should consider when they receive feedback from students.

In my analysis I observed that current MOOCs consider: (1) Self-directed learning. Wong mentions the importance of considering learner behaviour in his paper (2016:106). In addition, the literature also mentions the importance of considering self-directed learning ability in the design of MOOCs (Zhu, Bonk & Sari, 2018: 217), (2) Direct instruction. As mentioned in 'meet the instructors' factor, the tutor's role as guide is essential and instructors should accompany students during the whole learning process, (3) Reflective learning and collaborative learning. Discussion forums were the most common strategy to provoke reflection in students. As observed in the sample, all MOOCs used this tool and it was clear that this should be included when instructors design a MOOC as the aim is to enhance analytical skills. The literature reinforces this: pedagogical considerations such as collaborative learning support emerged as an aspect of MOOC design that should be considered by instructors (Zhu, Bonk & Sari, 2018: 215). Peer activities, also emerged as a new form of collaborative learning, are discussed in the following ‘individual, peer and group activities’ procedure, and in ‘types of feedbacks given?’ procedure.

Self-paced and flexible learning
This is an essential factor that must be included in a MOOC. Students’ management of their own learning from the first day of training is a valuable skill they will need to manage the MOOC, and it should be part of their academic life.

In my analysis and through a review of the literature on SDL, I have learned that MOOCs have particular features that require students meet additional demands such as becoming autonomous learners and managing their time (Hew, 2015: 325). They also need self-directed learning skills to cope with their own learning experience. As observed in the section ‘issue: hard sciences and soft sciences factor’ included in the previous ‘openness and free access guaranteed’ procedure, students also require digital skills. If not, as mentioned in the literature (Anderson et al., 2014: 1) and (Simonson & Maushak, 1996; Watson et al., 2016, cited in Zhu, Bonk & Sari, 2018: 223), a high number of students will drop out of the course. Thus, ‘self-paced and flexible learning’ in a MOOC is key to students managing their time and including this online training in their academic life, as well as being one of the favourite strategies used by instructors to keep students engaged in a MOOC (Zhu, Bonk and Sari (2018: 216).

Methodologies (e.g. active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based)

MOOCs are designed to keep students active during the course. MOOCs use active learning as a strategy to engage students in active participation (Zhu, Bonk & Sari, 2018: 219). In the study I found active learning activities such as group discussions, interactive learning activities (such videos, slideshows), and peer activities (although to a lesser extent). Active learning activities entail placing students at the centre of the learning process. Thus, one could say that MOOCs are designed and framed within a methodology that includes active learning, connectivism and networked learning in contrast to traditional training. In addition, MOOCs are based on tasks and problem solving. MOOCs, as observed, are designed and structured, firstly, by weeks, and secondly, by proposed tasks and assignments.

Didactic principles and methods communicated to the learners (e.g. orientation module, introductory unit, task guidelines)
i. Workload/week
ii. Course structure: week 1, week 2, week 3...

Returning to the previous ‘i. course length’ factor included in the ‘MOOC timeline’ procedure, Northwestern University (n.d.) and Burrus et al. (2014: 7) argue that students will achieve benefits during the learning experience by allowing teaching staff to deliver the required contents without overwhelming students when the course is around eight weeks in duration. In terms of workload per week this means about five hours per week. In this study, I found that at most, six hours per workload/week maintained high student engagement. Thus, one could argue that workload/week was a meaningful factor that had a direct impact on student engagement. The 'course structure' factor was closely related to course planning. In other words, I found that in courses where the 'course length' factor was around seven or eight weeks, student participation was higher. After the analysis of this factor, my findings reinforced what these studies, just mentioned above, have found, that MOOCs that work best are those with a course structure of seven weeks, at most.

- 'Concept for content' process:

Content structure (e.g. entry level – beginners, intermediate, advanced, novices, experts, units, modules, themes)

I found in my earlier discussion of the factor of 'level of the course' included in the 'entry-level' procedure, that the level of students was defined when a MOOC was designed. Once students had registered for the course, there was no way of identifying the different levels of students. I believe that because of the 'massiveness' of these courses, the target audience should be suitably defined from the outset; this should include the level of students.

Different media and presentation types of content

The use of different media types in MOOCs has many benefits for students. This was described in (1.4.1.4.1.) of section II. Owing to the particularity of MOOCs, media have an active and meaningful role, such as, social media, social media interactions (discussion forums, peer review assessment) and instructional videos and slideshows. The findings from the analysis of the sample in this study reinforce evidence from the literature and confirmed that the use of media in MOOCs is essential (Zhu, Bonk & Sari, 2018: 216). In this case, MOOC co-design in collaboration with students would shed light on the newest trends in social media among students (such as Twitter). Thus, embedding media in MOOCs as a basis for developing a course is essential as it encourages students to feel involved and active; and it also results in high student participation rates for the MOOC. In the case of wikis, I could find nothing relevant in the analysed sample.

Sources of the content? (e.g. re-use, self-development, contributions, external contracts, mixed approaches)

i. Supplementary course materials

Throughout my observations, I realised that it was usual for instructors in MOOCs to provide students with supplementary course materials. In fact, this reinforces the literature (Zhu, Bonk & Sari, 2018: 217). Despite providing learners with a minimum of content to pass the course, students could have at their disposal countless number of sources provided by instructors. Sometimes, these were created by instructors themselves, sometimes by academic staff searching for other sources such as portals, YouTube, scientific magazines, blogs, or websites.

- ‘Concept for learning activities’ process:

Individual, peer and group activities (e.g. self-test quizzes, peer-reviewed activities, small group case study)

In the observation phase I identified two different types of activities: (1) individual activities, instructional videos and their corresponding self-test quizzes, and (2) group activities such as peer-review activities. The first option was commonly in all the observed MOOCs, and it was an essential tool for completion of the course. The second option, however, was a tool not used by many instructors. I only identified it in eight of the 54 courses. As a result, I found that there was a high rate of student engagement compared to courses that did not offer this. In this case, the finding was that the peer-assessment activities promoted student participation.

Monitoring students' learning progress? (P) (e.g. progress bar, weekly generated feedback or checklist)	
i.	Students must be able to see clearly where they are with respect to the entire course.

Findings reinforced the literature: Zhu, Bonk and Sari (2018: 218) argue that the structure of MOOCs is based on training modules. This facilitates the tracking of students' progress and the monitoring of their achievements by instructors. On the other hand, this allows students to see a progress bar that indicates the percentage of the course that has been completed. Furthermore, students can see very easily where they are and at what point they have to continue the lessons.

- 'Technical concept' process:

Type of technical support offered for the staff and for the learners	
i.	Type of e-skills
ii.	Demo-course: How to navigate through the course
iii.	Bookmark (any courseware page)
iv.	Updates (if there are any)

A few of the MOOCs analysed in this study featured e-skills. When academic staff design a MOOC, they create the course with a particular target audience in mind who has the specific digital knowledge required to complete the MOOC. Despite this, in the MOOCs I observed, this factor was only found in courses in a few specific academic areas such as computing, in which students were required to carry out programming activities. As I mentioned in the previous ‘hard sciences’ factor, enhancing students’ digital skills was likely to be a factor in keeping higher student engagement. Regarding the ‘demo-course’ factor, I believe that this is a useful and essential tool for students who are making their first contact with MOOCs. Finally, the bookmark and updates were found to be useful and interesting tools. The first one is used to bookmark preferred articles or parts of the course that students want to highlight. This facilitates summarising of the contents by students. Updates is a tool that allows instructors to make updates reachable by students. These useful tools both enhance the learning experience by increasing students’ sense of agency during the MOOC rather than wasting their time.

- ‘Media design’ process:

Types of media (e.g. video lectures, digital text, animations, simulations)
i. Are there multimedia tools such as videos, audio clips or images?

Multimedia tools were discussed in the same factor in section II, (1.4.1.4.1). and also mentioned in the results. In this section I analyse the third and fourth options framed in tools and media that encourage student participation. These tools and media included: interactive materials (self-quizzes, assignments/tasks, computer-graded questions, interactive surveys, and peer-assessments) and videos, images and audios, where a set of questions is linked to these interactive tools. These two tools were an integral part of all the observed MOOCs. As mentioned, MOOCs are designed and approached with multimedia resources in mind. They are essential to ensuring the excellent delivery of contents. These were considered by instructors in Zhu, Bonk and Sari's (2018: 215) study.

Media concept (e.g. interactive media)

As I observed in the sample of MOOCs, the current trend is to use Twitter and blogs to approach the discussed topic. This is confirmed in studies that have found that instructors kept in touch with their students by using these tools (Dhir, 2019; Zhu, Bonk & Sari, 2018: 218). This practice is intended to enhance the user's experience, encouraging students to become more active and more communicative.

- 'Communication concept' process:

Communication concept
i. A welcoming lecture video presented by teaching staff

A welcoming video is the first step by which instructors create a bond with their students. There were welcoming videos in the sampled MOOCs. There were even courses where students could find this welcoming video before enrolling in the MOOC. However, this welcoming video has a direct impact on student engagement when it is accessed after students have enrolled in the course.

Other strategies to encourage learners to enrol in the course and to make the course more engaging for students
i. Rating by users, the number of ratings and the number of reviews of the course
ii. Views of numbers of students already enrolled

This first marketing strategy (rating by users, the number of ratings and the number of reviews of the course) was used mainly to appeal students and to make them feel that the MOOC they had chosen was the most suitable to meet their needs. However, this factor had a more efficient effect. This is considered by students to be a decisive benchmark when choosing, enrolling and participating in a MOOC. This statement is related to the fact that aggregators (a concept developed in 1.4.1.3.1. ‘Selection criteria for subject of study’ of section II) use this kind of information to help students to search for MOOCs more easily, and also to set up rating lists. I found this kind of information in half the courses in the sample. This was found to be a decisive factor with a direct positive relationship with the level of student participation. The second factor ‘view of number of already enrolled’ was intended as a strategy to appeal to students in a course. This is a cumulative factor over time that considers the number of runs in which the course has been delivered. Reflecting on this observation, I determined that MOOCs that included this factor had a higher rate of student participation during the course. This was also a clue to which students could identify whether a course was highly recommended by other students.

- 'Interaction concept' process:

What types of interaction will be used?	
i.	Are there discussion boards and chat rooms?
ii.	Collaborative learning support
iii.	Establishing study groups

Discussion boards are media used to encourage student participation. The findings from my observations that instructors relied on discussion forums to provide students with tools to develop and discuss the learning content, often provided in video-lectures, were supported by other studies (Zhu, Bonk & Sari, 2018: 217-218). Thus, discussion forums were found to be a design challenge for instructors whose goal was to promote active student participation. Collaborative learning, on the other hand, was provided by discussion boards as a working methodology. However, collaborative learning support, mentioned in (1.4.1.4.1), in section II, had its place only in some of the MOOCs in the sample when students participated in discussion forums. Thus, with the goal to build knowledge collaboratively and more effectively, it is necessary to go a step further by creating smaller learning groups or employing a larger number of instructors and/or students who previously completed the course. To conclude in my observations, chat rooms and study groups were not part of the MOOCs in the sample either. It was not possible to find a direct relation between these three factors and student participation and further research is required in this area. On the other hand, discussion forums and the resulting collaborative learning are a 'must' in MOOCs and they were featured in all MOOCs in the sample.

- ‘Feedback concept’ process:

Types of feedbacks given?
i. Types of feedback

It appeared from the literature and from the observations that feedback was the most effective tool to keep students active during the learning experience, especially in discussion forums. This tool should be used in all MOOCs in a bid to deal with the challenges posed by large numbers of students, and by distance learning. In fact, this is a most useful tool as continuous feedback allows to ensure effective learning and better support during the learning experience. Thus, more research, reflection and planning of how to organise instructors’ teams should be a requirement. A solution to the difficulties of providing continuous feedback could be the use of automated feedback when students complete a quiz. In this case, they would receive immediate automatic feedback that would explain where they went wrong. Also, added support from tutors on this wrong answer could be a solution in cases where students need it. In other words, direct feedback from tutors could be attached to these incorrect answers. Another proposal suggested to solve the problem of lack of feedback would be to increase the number of academic staff, perhaps by including previous students in the academic team. As recognition for their work, credits might provide meaningful motivation to carry out their tasks and at the same time acquire knowledge and skills. Here, ‘student participation in the co-design’ concept emerges once again. In addition, peer activities are a tool that elicits student feedback. In the observation, and as mentioned previously in ‘individual, peer and group activities’ procedure, peer activities were used to a lesser extent. Students expressed feeling frustrated with the lack of personalized feedback (Rice, 2013, as cited in Zhu, Bonk & Sari, 2018: 224). This is a claim that reminds us that, despite the fact that this is online training, students need to be listened to in order to solve their problems and allay the fears they may have during the learning experience.

- 'Concept of test and assessment' process

Concept for tests and assessments (e.g. formative assessment, summative assessment, authentic or work-integrated assessment, diagnostic assessment, criterion referenced assessment)

In the observed MOOCs, I found both formative and summative assessment. Despite formative assessment being most used, so that online training requires a constant monitoring and tracking of students, some examples of summative assessment practices were found (to a lesser extent, though). Formative assessment in the checked MOOCs comprised discussion forums, quizzes, assignments, tasks, computer-graded questions, peer-assessments and surveys. Examples of summative assessment included final exams, and to a lesser extent, final grades. Formative assessment helps instructors to identify the level of student engagement, and whether students are likely to complete the course successfully. Platforms provide instructors with appropriate technical tools that enable them to achieve a statistical photo. This reports how many steps students have visited and completed. An example is displayed in the following picture. Owing to the size and distance of MOOCs, these are the most suitable assessment methods that courses were currently offering to their students.

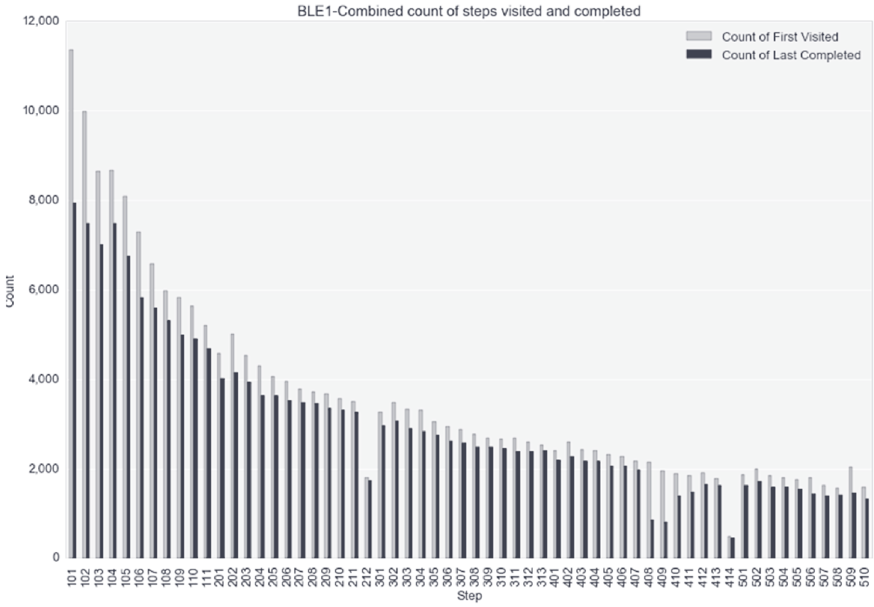


Figure 124. Steps visited and completed by students (Kennedy & Laurillard, 2019b: 2).

Test rating scales: grade system, scoring rubric system, point system, reviews or comments

In the matter of test rating scales, the scoring system was most used in MOOCs in quizzes, but when students want to receive a verified certificate, MOOCs used a grade system. Many instructors relied on automated grading for multiple-choice questions, quizzes and peer assessment to assess student learning, as in Zhu, Bonk and Sari's (2018: 215) study. I found that the assessment system was limited and instructors had to adapt to the learning management systems that were offered by the platforms. These included multiple-choice questions, and true-or-false or fill-in-the-blank exercises. In this case, instructors used peer assessment as an alternative to assess and to grade students in a bid to assess the thousands of students enrolled in the courses. I believe that the use of an automated system allows students the opportunity to understand and to assimilate the content they have learnt. They can usually repeat the exercise several times to improve their scores, or just simply to try to understand where they have wrong. Besides, MOOCs should encourage the participation in discussion forums by organising smaller groups of participants in a bid to manage them better. Finally, peer grading is in keeping with the nature of MOOCs for which they were created in the first place, the construction of knowledge and collaboration between students.

Assessment methods: self-test, quizzes, peer-reviewed assessments, small group collaboration

Closely connected to the previous factor, the most assessment tools found during the observation were self-test quizzes with scoring/grading. Quizzes included independent quizzes, embedded or in-video quizzes as key to advancing through the course and a way to assimilate the contents as the MOOC progressed. The use of peer review activities in MOOCs was also found, but not as commonly. This tool allows students to work in collaboration with others. Instructors can assess students in a critical and a constructive way, and teach students to use higher level thinking skills. In the observation, I did not find any relationship between course length and peer assessment, nor between knowledge area and peer assessment. In this case, instructors took a chance on this kind of assessment which was being used increasingly. The most interesting finding was that disciplines such as Engineering and Architecture included this strategy in their curricula. Of the eight courses that included peer-assessment activities, four were offered at an intermediate level. Thus, peer assessment was used on the one hand as a tool to address limitations of the MOOC (massiveness and the lack of feedback). Furthermore, on the other hand, peer assessment encouraged students during their learning experience and enhanced their self-study skills.

Despite being a useful assessment strategy, instructors should manage groups by trying to identify similarities in, for instance, level of knowledge, in order to improve effective learning.

Programming assignments were another type of activities found where the academic discipline that required students to write and run a computer program to solve a problem set by instructors. No evidence was found in the sample of projects such as case studies or problem-solving activities as a strategy for assessment. This would require students to research and to reflect, and the massiveness of the MOOCs would make this very difficult for tutors to deal with; I believe that this is why they did not use this type of strategy.

How learners receive their results from tests and assessments

Students receive their results via automated methods, except in peer-review activities. The reasons for this are that in online training, students want to know immediately how they are assimilating the contents, and instructors track whether students are working in the right way to pass the course. These methods are designed to give quick responses to students about their assignments. This automated tool encourages students to continue working throughout the course, not allowing them the chance to drop out of the MOOC.

1.2 Proposals for interventions

In order to obtain an appropriate diagnostic proposal, the ideal would be to carry out the following actions. After this research, further reflection and co-working between academic staff and participating students would be required. This would be about the setting of tools that would help to improve the MOOC design phase where the identified factors have a meaningful role. Thus, new designs in the next run of MOOCs would include improvements that would enable us to identify how student engagement changes during the course.

This same diagnostic tool could be implemented in other samples of MOOCs in other fields of knowledge. This study was intended to also provide evidence on whether there are different criteria for other academic disciplines such as the humanities, social sciences, natural sciences, formal sciences, and applied sciences.[44] However, I insist that it is essential to start the process by determining the most appropriate factors that facilitate higher student participation. This research study is focused on hard sciences.

1.3 Future research lines

From the findings discussed in the previous chapter, one in particular that emerges is the need to continue research on student participation and co-design in the framework of MOOCs. These future research lines described below are phrased as a proposal, based on the fact that research was carried out in this field, which is still at an early stage so far.

[44] Academic disciplines. Retrieved from: <https://en.wikipedia.org/wiki/Outline_of_academic_disciplines>. Last accessed October 3, 2020.

a) The study should go into more detail about the potential of MOOCs to identify whether there is an appropriate target audience for MOOCs or whether they can be adapted to suit different types and levels of audience.

b) Once the results of this study were known and co-working at a round table between instructors and students have begun, new runs of these MOOCs should be carried out, including the most suitable factors. After the completion of courses, a new study using $CAT_{50\%}$ is required to identify whether these factors are related to student engagement.

c) New comprehensive and systematic research should be conducted in other academic disciplines to identify whether factors that encourage student participation are inherent to the knowledge field.

d) An analysis of the chosen tools that encourage student participation and which are also part of strategies aimed at enhancing effective teaching and learning should be carried out.

e) Other forms of organisational makeup of academic staff should be planned and analysed to provide quick feedback to the massive number of enrolled students, as the lack of monitoring by instructors is a limitation found in the literature.

f) MOOCs should be included in the academic guidelines as this will allow a more appropriate targeting strategy (more comprehensive and systematic) for MOOC design (learning activities and assessment).Research and design of this strategy should include aspects such as: 1) the incorporation of MOOC design process in the instructor's workload, 2) the identification of those MOOC factors that encourage student participation, and 3) the regulation of academic policies related to how to recognise MOOCs in official degrees at universities and institutional level.

g) More research is required on the development of a quality assurance guide that facilitates the creation of MOOCs that meet students' needs and the needs of the academic discipline, with the goal of maintaining high rates of student engagement.

This chapter covered some of the future research strands regarding MOOC design, the encouragement of student participation in MOOCs, and the consolidation of these online courses. These MOOCs have experienced an exponential growth recently, especially over this last year during the current situation (2020). The goal is to formally include this training in academic procedures in order that academic staff can design MOOCs that will achieve effective teaching and learning, and ensure high levels of student engagement. Given this new social scenario, universities should include research and strategic approaches to these new learning models in which MOOCs have a meaningful role to play.

1.4 Synthesis of discussion and conclusions

This chapter provided reflections, discussions, proposals for interventions and future research strands that emerged from the findings of this research study. In a bid to draw conclusions, all of these were focused on exerting a positive effect on student engagement. The main goal was to propose new research strands, and to take a step further in the continuous evolution of online learning, where MOOCs are undergoing exponential growth.

Chapter 2. A proposal of a methodological outline

2.1 Methodological outline

After the evaluation of the extracted factors that encourage student engagement, I developed a methodological outline to meet the needs of MOOCs in the hard sciences. This covered how to facilitate the process of MOOC design by instructors. The final aim was to create a MOOC which: 1) encouraged student engagement, and 2) provided effective teaching and learning.

Student engagement and effective learning are two concepts that are aimed at the same direction. Thus, when engagement is high, the effectiveness of learning follows. The following identified factors promote engagement when: (1) Learning is problem-based "and supported with simple-to-understand explanations of procedures or concepts" […], (2) […] "the course staff is accessible and shows passion in teaching the course", (3) […] "active learning is emphasized and supported", and (4) […], "when peer interaction is promoted and course resources are used to address participants' diverse learning preferences" (Hew, 2015: 321).

Methodological outline:

"How to design MOOCs to facilitate student participation"

What factors should the instructors consider in the design phase of a MOOC with the goal to ensure high student participation rates?

This methodological outline was created in the framework of xMOOCs, where students have the choice to build knowledge through collaborative methodologies. Furthermore, this was developed in the following areas of knowledge in Hard Sciences: (1) Architecture, Civil and Environmental Engineering, (2) Basic Sciences, (3) Engineering, (4) Computer and Communication Sciences, (5) Life Sciences, (6) Management of Technology, and (7) Aquatic Science and Technology. Other hard science disciplines and social sciences disciplines were not the subject of study. Thus, the use of this methodological outline is not recommended unless an analysis using the $CAT_{50\%}$ index is undertaken first.

The following table illustrates the MOOC design phase organised by processes, in which are defined the most meaningful factors to consider when a MOOC is created.

More detailed information about the explanation of the chosen options can be found in chapter 1 of the section IV. 'Conclusive framework'.

1. **MOOC co-design process in collaboration with students**
As you will see throughout this methodological outline, MOOCs co-design in collaboration with students, is a meaningful and useful tool that can help instructors to create a MOOC. In some factors, co-design emerges as a tool that might improve the identification and the enhancement of factors that comprise a MOOC. The inclusion of students as co-creators of learning methods, course design, and curricula in the MOOC design process cannot be confirmed with certainty as useful, nor can one conclude to what extent the level of student participation is beneficial. This is because a lack of studies currently; thus, more research is required. You can find

more information on good practices in (1.1.2). 'Co-design of MOOCs in collaboration with academic staff and students', in section IV. In this part, one can consult that students can provide savvy tech and content viewpoints. This allows us to open new doors for reflection and research with the goal to make it possible to achieve benefits for both instructors and students. On the one hand, instructors might gain a more appropriate and approximated approach to defining a MOOC that best meets students' needs. On the other hand, students might experience deeper learning. The lack of findings on this topic prevented me from including more information.

2. Learning objectives process

Learning objectives:

- Target audience of the MOOC. You should address a specific audience. Those that work best are MOOCs aimed at 'Bachelor' and a 'specific target audience'.
- Prerequisites. Specifying prerequisites is not relevant during the design of a MOOC.
- Main aim of the course. You should be very accurate in the definition of main course aims.
- Main objectives of the course. A quick overview of all the topics that will be developed during the course. You should plan the MOOC per week and type of activity. Planning by topics does work, but to a lesser extent.
- Design of learning objectives each week after enrolling, during the course. You should consider the definition of learning objectives by weeks, before each lesson. It is not relevant if they are not completely accurate.

- Other ways of finding learning objectives: What you will learn. It is not necessary to consider the definition of competences acquired once the MOOC has been completed during the MOOC design process.
- Skills you will gain. You should consider the definition of skills you will attain on the completion of the MOOC.
- Course handouts. It is not necessary to deliver handouts in the MOOC.

Entry-levels (e.g. beginners, intermediate, advanced, novice, experts)

- Level of the course: introductory, intermediate, advanced. You should consider addressing the MOOC to a target audience from the outset of the design phase. MOOCs that work best are those aimed at beginner and intermediate level.

Assessment of learning objectives (e.g. formative assessment, weekly quizzes, multiple-choice tests, delivery of a product, essay, final exam)

- Evaluation of learning objectives. You should plan your MOOC within the framework of formative assessment. You should include learning assessment tools such as discussion forums, weekly quizzes, peer assessment activities, and automated grading for multiple-choice questions.

3. Organisational concept and roles process

MOOC timeline

- Course length. You should design a MOOC with a maximum length of 40 hours.

Openness and free access guaranteed

- Language: English. It is not relevant whether the MOOC is delivered in English or not; language is not regarded as a limitation. What is more, the language of tuition is a factor that encourages students to register for a MOOC.
- Transcriptions of videos: English, Spanish, Chinese. You should include video transcription. The use of several languages is an attractive factor for students.
- Free course. You should consider offering the MOOC in a free mode from the outset. Thereafter, an affordable amount for tuition fees with the goal of receiving a certificate can be offered during the MOOC.
- Provide a verified certificate at an affordable fee. You should always provide a verified certificate on completion of the MOOC.
- Allow upgrades to verified at any time during the course. This strategy encourages student participation.
- Which institution? University. You should consider that the institution to which the MOOC is affiliated is significant to students. Thus, consider offering MOOCs in those academic disciplines in which the institution is at the forefront.
- Is financial aid available? You should consider offering this powerful tool to students who cannot afford to pay tuition fees. In addition to the important social work that this entails, this social programme may arouse the interest of many students. Furthermore, it is more likely that students who have completed a MOOC would trust in MOOCs for future training.
- Meet the instructors. You should always keep close contact and be available to your students. From the beginning, students should know their tutors and have the feeling that they will be accompanied throughout the learning process. A

constant connection with students makes them feel involved and committed during the learning process. These are tools that build and strengthen the bond between instructors and students:

(1) A self-presentation by instructors at the beginning of the course.

(2) Encourage students participate actively during the course.

(3) Keep close to students by replying to all their questions and suggestions quickly. Students must have the feeling that they are constantly listened to.

(4) Be respectful and kind.

(5) Ask for constant feedback from students to learn whether they are pursuing the course properly to achieve the defined goals.

- Issue: Hard sciences or soft sciences. You should consider that these factors have been analysed within the field of hard sciences, particularly in the abovementioned knowledge areas.

4. Didactic concept and methods process

Type of didactic principle (e.g. self-directed learning, direct instruction, reflective learning, collaborative learning, emotional learning)

- SDL (Self-directed learning). You should consider SDL when designing a MOOC as this is closely related to online training. This is a meaningful skill that students must use to complete a course. More information can be found in (1.1.3). ‘Processes, procedures and factors most likely to encourage student engagement’ of section IV.
- Direct instruction, reflective learning, collaborative learning. You should undertake a mix of these teaching methods. Instructors must always be at the forefront, guiding and providing support during the learning process and

providing direct instruction. Reflective learning should also be included through discussion forums emerging from issues raised. Finally, you should make students engage in collaborative learning through discussion forums and peer-assessment activities.

- Emotional learning or cultural sensitivity. No relevant findings.

Self-paced and flexible learning

- Self-paced and flexible learning. You should consider flexibility in completing the MOOC. Students must include this training in their academic lives. Self-paced learning, in other words, the personalisation of training is a requirement in MOOCs.

Methodologies (e.g. active-learning oriented, learner-centered, network-oriented, task-based, interactive-based, problem-based).

- Active-learning oriented. You should use active learning strategies such as peer-activities, group discussions, the role of the instructors, interactive learning activities such as videos, slideshows, images, and cooperative learning activities.
- Learner-centered. You should embed activities that encourage an active, participatory and critical role by students through exchange, communication and cooperation.
- Network-oriented. You must encourage the bonds between students themselves and strengthen the bond between instructors and students.
- Task-based. You should plan your MOOC as follows. First, by weeks, then, by topics. Finally, by tasks, and assignments.

- Problem-based tasks. You could consider including small projects or activities based on a problem-solving approach.

Didactic principle and methods communicated to the learners (e.g. orientation module, introductory unit, task guidelines).

- Workload/week. You should include this information at the beginning of the MOOC, even before students decide to register for the course. You should plan your MOOC so that students have a six-hour workload per week, at most.
- Course structure: week 1, week 2, week 3.... You should plan your MOOC with a course length of seven weeks, at most.

5. Concept for content process

Content structure (e.g. entry level – beginners, intermediate, advanced, novices, experts, units, modules, themes)

- Content structure. More information in the previous factor ‘level of the course’ in ‘Entry-levels (e.g. beginners, intermediate, advance, novice, experts)’ procedure.

Different media and presentation types

- Different media and presentation types. You should embed media tools such as social media, social media interactions (discussion forums, peer review assessment), and instructional videos, slideshows in your MOOC. Using MOOC co-design (in collaboration with students) would shed more light on the newest trends in social media by students (such as Twitter).

Sources of the content (e.g. re-use, self-development, contributions, external contracts, mixed approaches)?

- Supplementary course materials. You might include other resources that students could use in case they want to find out more about the subject matter in the MOOC. Sources include portals, YouTube, scientific magazines, blogs, or websites.

6. Concept for learning activities process

Individual, peer and group activities (e.g. self-test quizzes, peer-reviewed activities, small group case study)

- Individual, peer and group activities (e.g. self-test quizzes, peer-reviewed activities, small group case study). You should embed two types of activities: (1) individual activities, instructional videos and their corresponding self-test quizzes, and (2) group activities such as discussion forums and peer-reviewed activities.

Monitoring students learning progress (P) (e.g. progress bar, weekly generated feedback or checklist)?

- Students must be able to see clearly where they are with respect to the entire course. You must ask your platform/provider whether this tool is provided. Information such as the progress of students or their rate of course completion should be available to both instructors and students at any time.

7. Technical concept process

Type of technical support offered to staff and learners

- What e-skills are needed? You should consider providing your target audience with this information. These skills are necessary to complete the MOOC.
- Demo-course: How to navigate through the course. You should contact your platform/provider to find out whether a demonstration-course adapted to your needs and your students' needs is available for your learners. The goal is to make the academic experience easier for students.
- Bookmark (any courseware page). You must inform your platform/provider about the availability of this tool. This enhances students' academic experience.
- Updates (if there are any). You must ask your platform/provider about the availability of this tool. This makes easier and improve students' academic experience.

8. Media design process

Types of media (e.g. video lectures, digital text, animations, simulations)

- Are there multimedia tools such as videos, audio clips or images? As previously mentioned, you should embed multimedia resources, such as interactive materials (self-quizzes, assignments/tasks, computer-graded questions, interactive surveys, and peer-assessment), videos, images and audios with a set of questions linked to these interactive tools.

Media concept (e.g. interactive media)

- Media concept (e.g. interactive media). You should include interactive media such as Twitter or specific blogs, according to students' preferences. The importance of embedding a co-design process is meaningful in this regard. Students can provide information about their preferences.

9. Communication concept process

Communication concept

- A welcoming lecture video by teaching staff. You should always keep close contact with students during the learning experience. A welcoming lecture video is the first tool that instructors should use to make students feel closer to their instructors.

Other strategies to encourage learners to enrol in the course and to make the course more engaging for students

- Ratings by users, the number of ratings and the number of reviews of the course. You should use this powerful tool when design your MOOC. Students consider this to be a meaningful tool and a decisive benchmark when choosing a MOOC. Contact your platform/provider.
- View of number of student enrolments. You should also embed this information in your MOOC. Contact your platform/provider.

10. Interaction concept process

Which types of interaction will be used?

- Are there discussion boards and chat rooms? You should always embed discussion forums as a main tool in your MOOC outline.
- Collaborative learning support. Collaborative learning is a working methodology that emerges from discussion forums and peer-review activities.

You should consider creating support (possibly from previous participant students or academic staff) for this type of activity.

11. Feedback concept process

Types of feedbacks

- Types of feedback. You should encourage student feedback throughout the MOOC, through activities such as discussion forums, the use of automated feedback (quizzes), and a quick response from tutors in case students have any questions, or they make mistakes in quizzes. You could consider including students who have completed the course to help to provide students with personalised feedback. Furthermore, you should also embed peer activities.

12. Concept of test and assessment process

Concept for tests and assessments: formative assessment, summative assessment

- Formative assessment. You should include a formative assessment method in MOOCs offering activities such as the following throughout the course: discussion forums, quizzes, assignments, tasks, computer-graded questions, peer-assessments and surveys.
- Summative assessment. Despite formative assessment being most recommended, you can include summative assessment method such as final exams, to a much lesser extent.

Test rating scales: grade system, scoring rubric system, point-system, reviews or comments

- Test rating scales: grade system, scoring rubric system, point-system, reviews or comments. You must contact to your platform/provider before starting the MOOC design process to ascertain the technical options that the platform offers in its learning management systems. You should embed a grade system, multiple-choice, true-or-false or fill-in-the-blank questions and so on (if necessary), planning and adapting your MOOC to the technical assets and response time. As previously mentioned, you should include peer-review assessment through reviews or comments from other students.

Assessment methods: self-test, quizzes, peer-reviewed assessments, small group collaborations

- Assessment methods: self-test, quizzes, peer-reviewed assessments, small group collaborations. As mentioned repeatedly in this methodological outline, you should include self-test quizzes with automated scoring/grading. Quizzes can be independent quizzes, embedded or in-video quizzes as key elements to advance through the course and assimilate the contents as the MOOC progresses. Furthermore, you should embed the use of peer review activities in your MOOC to foster higher level thinking skills. In addition, there are other options of assessment methods such as programming assignments, according to the academic discipline covered in the MOOC.

How learners receive their results from tests and assessments

- How learners receive their results from the tests and assessments. You should combine automated (quizzes) and manual methods (peer-review activities) in your MOOC to provide results to students.

Back matter

Bibliography

A learning journey (2017, March 13). *Self-Directed vs Self-Regulated Learning.* Retrieved from <https://alearningjourneyweb.wordpress.com/2017/03/13/self-directed-vs-self-regulated-learning/>. Last accessed April 11, 2020.

Abulencia Gabiola, G. (2015, September 10). *Engaging student voice in developing approaches to improve teaching and learning.* Retrieved from <https://genefergabiola.wordpress.com/2015/09/10/engaging-student-voice-in-developing-approaches-to-improve-teaching-and-learning/>. Last accessed April 14, 2021.

Acat, B., Dönmez, I. (2009). *To compare student centred education and teacher centred education in primary science and technology lesson in terms of learning environments*. Procedia - Social and Behavioral Sciences, 1(1), 1805–1809. https://doi.org/10.1016/j.sbspro.2009.01.320.

Agarwal, A. (2013, June). *Why massive open online courses (still) matter.* Retrieved from <https://www.ted.com/talks/anant_agarwal_why_massive_open_online_courses_still_matter>. Last accessed July 2, 2020.

Akash (2018, January 2). *Online Education: Learn anywhere, anytime.* Retrieved from <https://digitallearning.eletsonline.com/2018/01/online-education-learn-anywhere-anytime/>. Last accessed October 31, 2020.

Ally, M., Embi, M.A., Norman, H. (Eds.). (2019). *The Impact of MOOCs on Distance Education in Malaysia and Beyond* (1st ed.). Routledge. https://doi.org/10.4324/9780429398476.

Anderson, A., Huttenlocher, D., Kleinberg J., Leskovec, J. (2014, March). *Engaging with Massive Online Courses.* Retrieved from <https://www.cs.cornell.edu/home/kleinber/www14-courses.pdf>. Last accessed April 20, 2020.

Annis, L. F. (1983). *The processes and effects of peer tutoring*. Human Learning: Journal of Practical Research & Applications, 2(1), 39–47.

Arnstein, S.R. (1969) *A ladder of citizen participation*, Journal of the American Institute of Planners, 35(4), 216-224, DOI: 10.1080/01944366908977225.

Barnes, D. (1989). *Active Learning.* Leeds University TVEI Support Project. Retrieved from <https://webcache.googleusercontent.com/search?q=cache:P3onQSOdRhEJ:https://lo.unisa.edu.au/mod/book/view.php%3Fid%3D610988%26chapterid%3D101290+&cd=1&hl=es-419&ct=clnk&gl=ch&client=safari>. Last accessed March 21, 2021.

Barnett, R., Coate, K. (2005). *Engaging the curriculum in Higher Education*, Maidenhead: Society for Research into Higher Education and Open University Press.

Batchwood School (n.d.). *What are learning objectives?* Herts. Retrieved from <http://batchwood.herts.sch.uk/files/Learning-Objectives.pdf>. Last accessed April 15, 2020.

Bartolome, L.I. (2003). *Beyond the methods fetish: toward a humanizing pedagogy*, In Darder, A., Baltodano, M. and Torres, R.D. (Eds), The critical pedagogy reader, (pp.408-429). New York: Routledge Falmer.

Bates, T. (2012, August 5). *'What's Right and What's Wrong about Coursera-style MOOCs'*, Online Learning and Distance Education Resources. Retrieved from <http://www.tonybates.ca/2012/08/05/whats-right-and-whats-wrong-about-coursera-style-moocs/>. Last accessed January 12, 2013.

Berger, L. (n.d.). *How to build a strong relationship with your professor.* Retrieved from <https://www.internqueen.com/how-build-strong-relationship-your-professor>. Last accessed June 21, 2020.

Bhaskar, S. (2013, November 8). *New ways of using multimedia in Classroom.* EdTechReview. Retrieved from <https://edtechreview.in/trends-insights/insights/746-new-ways-of-using-multimedia-in-classroom>. Last accessed April 19, 2020.

Bloor, M., Bloor, T. (1988). *Syllabus negotiation the basis of learner autonomy*, in: A. Brookes & P. Grundy (Eds) Individualisation and autonomy in language learning. ELT documents 131 (London: Modern English Publications and The British Council).

Boekaerts, M., Corno, L. (2005). *Self-regulation in the classroom: A perspective on assessment and intervention*. Applied Psychology: An International Review, 54(2), 199–231. https://doi.org/10.1111/j.1464-0597.2005.00205.x

Bonk, C., Miyoung Lee, M., Sheu, F., Kou X. (2014). *Research on Self-directed Informal Learners in Open Educational Environments and Massively Open Online Courses*. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.450.5275&rep=rep1&type=pdf>. Last accessed May 15, 2016.

Bovill, C. (2009). *Influences on the nature of active student participation in curriculum design: An investigation of three case studies from Higher Education.* Unpublished masters thesis, University of Glasgow.

Bovill, C., Aitken, G., Hutchison, J., Morrison, F., Roseweir, K., Scott, A., Sotannde, S. (2010). *Experiences of learning through collaborative evaluation for a Masters programme in professional education*, International Journal for Academic Development, 15(2) 143-154. 10.1080/13601441003738343.

Bovill, C., Bulley, C.J. (2011). *A model of active student participation in curriculum design: exploring desirability and possibility*. In Rust, C. Improving Student Learning (18) Global theories and local practices: institutional, disciplinary and cultural variations. Oxford: The Oxford Centre for Staff and Educational Development, 176-188. ISBN 9781873576809.

Bovill, C., Cook-Sather, A., Felten, P. (2011). *Students as co-creators of teaching approaches, course design, and curricula: implications for academic developers*. International Journal for Academic Development, 16 (2), 133–145. 10.1080/1360144X.2011.568690.

Bovill, C., Morss, K., Bulley, C. (2008). *Curriculum design for the first year*, First Year Enhancement Theme Report, Glasgow: QAA (Scotland). Retrieved from <https://www.enhancementthemes.ac.uk/docs/ethemes/the-first-year/curriculum-design-for-first-year.pdf?sfvrsn=1a62f981_8>. Last accessed April 30, 2021.

Bovill, C., Morss, K., Bulley, C. (2009) *Should students participate in curriculum design? Discussion arising from a first year curriculum design project and a literature review.* Pedagogic Research in Maximizing Education (3) 2, 17-26.

Bowen, G. (2009). *Document Analysis as a Qualitative Research Method.* Qualitative Research Journal. 9. 27-40. 10.3316/QRJ0902027.

Braun, A. (2018, October 25). *4 of best MOOC Platforms for Online Learning and Getting a Degree*. Maketecheasier. Retrieved from <https://www.maketecheasier.com/best-mooc-platforms-online-learning/>. Last accessed June 16, 2019.

Brent D., Sumara, D. (2005). *Constructivist Discourses and the Field of Education: Problems and possibilities*. Educational Theory. 52. 409 - 428. 10.1111/j.1741-5446.2002.00409.x.

Breen, M.P., Littlejohn, A. (2000a). *The Significance of negotiation*, in M.P. Breen & A. Littlejohn (Eds) *Classroom decision-making: negotiation and process syllabuses in practice* (Cambridge: Cambridge University Press).

Breen, M.P., Littlejohn, A. (2000). *The practicalities of negotiation.* In M.P. Breen and A. Littlejohn (Eds.), Classroom decision-making. Negotiation and process syllabuses in practice (pp. 272–295). Cambridge, UK: Cambridge University Press.

Brew, A. (2006). *Research and teaching: Beyond the divide*. Macmillan International Higher Education.

Brew, A., Barrie, S. (1999). *Academic development through a negotiated curriculum*, International Journal for Academic Development, 4(1) 34-42. DOI: 10.1080/1360144990040106

Briggs, S. (2013, June 7). *How peer teaching improves student learning and 10 ways to encourage it*. Retrieved from <https://www.opencolleges.edu.au/informed/features/peer-teaching/>. Last accessed April 14, 2021.

Brown A., Browne L., Collett K., Devereux C., Jameson J., centre for the use of research and evidence in education (2012). *The role of coaching in vocational, education and training*. Retrieved from <https://warwick.ac.uk/fac/soc/ier/publications/2013/brown_2013_insights-the-role-of-coaching-in-ve.pdf>. Last accessed October 31, 2020.

Brown, J. S., Collins, A., Duguid, P. (1989). *Situated Cognition and the Culture of Learning.* Educational Researcher, 18(1), 32–42. https://doi.org/10.3102/0013189X018001032.

Bruce, E. (2017). *6 Major Types of Collaborative Learning.* EzTalks. Retrieved from: <https://www.eztalks.com/elearning/6-major-types-of-collaborative-learning.html>. Last accessed July 4, 2020.

Burrus, S., Lynne, C., Shaw M. (2014). *Course length recommendations in online Higher Education*. Journal of Online Higher Education. The Learning Institute. February, 5 (2).

Checkoway, B. (2018). *Inside the Gates: First-Generation Students Finding Their Way*. doi:10.5539/hes.v8n3p72. Retrieved from <https://doi.org/10.5539/hes.v8n3p72>. Last accessed June 2020.

Chioran, A. (2016, November 23). *5 benefits of multimedia learning.* Retrieved from https://www.nuiteq.com/company/blog/5-benefits-of-multimedia-learning. Last accessed January 23, 2021.

Christodoulou, E. (2013, June 22). *Top 20 skills you need to develop your career.* Retrieved from <http://mystarjob.com/articles/story.aspx?file=/2013/6/22/mystarjob_careerguide/13226186&sec=mystarjob_caree>. Last accessed April 17, 2020.

Clark, D. (2013, April 25). *MOOCs: Who's using MOOCs? 10 different target audiences*. Retrieved from https://donaldclarkplanb.blogspot.ch/2013/04/moocs-whos-using-moocs-10-different.html. Last accessed May 20, 2018.

Clarke, D.F. (1991) *The negotiated syllabus. What is it and how is it likely to work?* Applied linguistics, 12(1). March 1991, Pages 13–28, https://doi.org/10.1093/applin/12.1.13

Collis, B., Moonen, J. (2005). *An on-going journey: technology as a learning workbench*. Retrieved from <http://doc.utwente.nl/50888/1/rede_Collis_Moonen.pdf>. Last accessed September 15, 2010.

Commonwealth of Learning, (2016). *Guidelines for Quality Assurance and Accreditation of MOOCs*. Project Report. Commonwealth of Learning, Burnaby, British Columbia.

Contactnorth (2020, August 4). *A New Pedagogy is emerging and online learning is a key contributing factor*. Retrieved from <https://teachonline.ca/sites/default/files/tools-trends/downloads/a_new_pedagogy_is_emerging.pdf>. Last accessed October 7, 2020.

Cook-Sather, A. (2011). *16: Teaching and learning together: College faculty and undergraduates cocreate a professional development model.* To Improve the Academy. 29. 219-232. 10.1002/j.2334-4822.2011.tb00633.x.

Cook-Sather, A. (2010a). *Students as learners and teachers: taking responsibility, transforming education, and redefining accountability*, Curriculum Inquiry, 40 (4) (September 2010), 555-575.

Cooke, B., Kothari, U. (2001). *The case for participation: the new Tyranny?* In B. Cooke and U. Kothari (Eds.), Participation: the new tyranny? (p. 1–15). London: Zed Books.

Cooper, S. (2013, January 12). *MOOCs: Disrupting the University or Business as Usual?* Arena Journal. Retrieved from <https://arena.org.au/moocs-disrupting-the-university-or-business-as-usual/>. Last accessed May 10, 2018.

Coursera (2020). *Data needs for climate and health policy.* Retrieved from <https://www.coursera.org/lecture/climate-change/data-needs-for-climate-and-health-policy-part-i-6Nyf6>. Last accessed April 25, 2020.

Coursera (2020). *Help Articles*. Retrieved from <https://learner.coursera.help/hc/en-us/articles/209818753-Programming-assignments>. Last accessed April 25, 2020.

Coursetalk (n.d.). *Leaderboard*. Top course providers. Retrieved from <https://www.coursetalk.com/leaderboard>. Last accessed April 8, 2021.

Creswell, J. W. (2006). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Sage Publications, Inc.

Crowther, J., Galloway, V., Martin, I. (2005). *Introduction: radicalising intellectual work*, In Crowther, J., Galloway, V. and Martin, I. (eds) Popular education: engaging the academy. International perspectives, Leicester: Niace.

Davis, S. (2014, February 4). *Facilitator as coach, teacher, trainer, and Mentor*. Retrieved from: <https://facilitatoru.com/training/facilitator-as-coach-teacher-trainer-and-mentor/>. Last accessed October 2, 2020.

Dede C. (2004). *Planning for "Neomillennial" Learning Styles: Implications for Investments in Technology and Faculty*. Retrieved from: <https://www.educause.edu/research-and-publications/books/educating-net-generation/planning-neomillennial-learning-styles-implications-investments-tech>. Last accessed October 31, 2020.

Delaney, Y., Farrell, A., Hack, C.J., Lawlor, B., McLoone, S.C., Meehan, A., Phillips, D.T., Richardson, I. (2015). *An Introduction to Enquiry/ Problem-based Learning. Maynooth: Facilitate and the All Ireland Society for Higher Education (AISHE)*. Retrieved from <http://www.aishe.org/wp-content/uploads/2016/01/4-Enquiry_Problembased-Learning.pdf>. Last accessed June 2, 2008.

Delpish, A., Darby, A., Holmes, A., Knight-McKenna, M., Mihans, R., King, C., Felten, P. (2010). *Equalizing voices: student faculty partnership in course design*, in C. Werder & M. Otis (Eds) Engaging student voices in the study of teaching and learning (Virginia: Stylus).

Dewey, J. (1916). *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan.

Dhiman, G. (2015). *80+ Best MOOC (Massive Open Online Course) Providers List*. Knowledge Lover. Retrieved from: <https://knowledgelover.com/best-mooc-massive-open-online-course-providers-list/. Last accessed May 20, 2018.

Dhir, R. (2019, June 25). *Interactive Media*. Retrieved from: <https://www.investopedia.com/terms/i/interactive-media.asp>. Last accessed July 2, 2020.

Dirckinck-Holmfeld, L., Jones, C., Lindström, B. (2009). *Analysing Networked Learning Practices in Higher Education and Continuing Professional Development*. Rotterdam: Sense Publishers, BV, 2-3.

Dunne, D. (2018). *Implementing design thinking in organizations: an exploratory study*. J Org Design 7, 16 (2018). https://doi.org/10.1186/s41469-018-0040-7.

Ebben, M., Murphy, J.S. (2014). *Unpacking MOOC scholarly discourse: A review of nascent MOOC scholarship.* Learning, Media and Technology, 39(3), 328-345. doi: 10.1080/17439884.2013.878352

Edelberg, E. (2019, February 21). *8 Benefits of transcribing & captioning videos.* Retrieved from https://www.3playmedia.com/2019/02/21/8-benefits-of-transcribing-captioning-videos/. Last accessed July 25, 2020.

EdX (n.d.). *What is a verified certificate?* Retrieved from: <https://www.edx.org/verified-certificate>. Last accessed May 15, 2021.

EdX Learner Help Center (2021, May 15). *How do I apply for financial assistance?* Retrieved from <https://support.edx.org/hc/en-us/articles/215167857-How-do-I-apply-for-financial-assistance->. Last accessed May 15, 2021.

Embraced Wisdom Resource Group (2015, November 1). *Mix methods convergent parallel design.* Retrieved from: <https://www.youtube.com/watch?v=0CRwUYsNVwU>. Last accessed August 22, 2020.

Entwistle, N.J. (1988). *Styles of learning and teaching*. London: David Fulton.

Σπηλιωτόπουλος, Νῶε, (2019, January 24). *Measures of position section 3.3.* Retrieved from <https://slideplayer.com/slide/16117005/>. Last accessed January 24, 2021.

Exley, K. (2013). *Encouraging student participation and interaction*, Reflections, Centre for Educational Development, pp.1-3. Retrieved from <https://www.qub.ac.uk/directorates/AcademicStudentAffairs/CentreforEducationalDevelopment/FilestoreDONOTDELETE/Filetoupload,432480,en.pdf>. Last accessed May 4, 2021.

Fielding, M. (2001). *Students as radical agents of change. Journal of Educational Change*,2(3), 123–141, doi: 10.1023/A:1017949213447

Fink, L.D. (2003). *Creating significant learning experiences: An integrated approach to designing college courses*. Jossey-Bass, San Francisco.

Fischer, M.C.B. (2005). *The methodology of 'systemisation' and its relevance to the academy*, In Crowther, J. Galloway, V. and Martin, I. (eds) Popular education: engaging the academy. International perspectives, Leicester: Niace.

Formplus Blog (2020, December 4). *Descriptive research Designs: Types*, Examples and Methods. Retrieved from https://www.formpl.us/blog/descriptive-research. Last accessed August 30, 2020.

Fraser, S., Bosanquet, A. (2006) *The curriculum? That's just a unit outline, isn't it?* Studies in Higher Education, 31(3) 269-284. Doi: 10.1080/03075070600680521.

Freire, P. (2003) *From pedagogy of the oppressed*, In Darder, A., Baltodano, M. and Torres, R.D. (Eds) The critical pedagogy reader (57-96), New York: RoutledgeFalmer.

Ganti, Ak. (2019, August 22). *Median.* Retrieved from: <https://www.investopedia.com/terms/m/median.asp>. Last accessed September 20, 2020.

Gasevic, D., Kovanovic, V., Joksimovic, S., Siemens, G. (2014). *Where is research on massive open online courses headed? A data analysis of the MOOC Research Initiative.* The International Review of Research in Open and Distributed Learning, 15(5). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1954. Last accessed May 4, 2021.

Gaudreau, C., Liu, W. (2016, March 30). *9 types of feedback to boost student engagement*. Retrieved from: <https://elearningindustry.com/9-types-of-feedback-boost-student-engagement>. Last accessed April 28, 2020.

Giroux, H.A. (1981) *Toward a new sociology of curriculum*, in H.A. Giroux, A.N. Penna & W.F. Pinar (Eds) Curriculum and instruction alternatives in education. Berkerley: McCutchen Publishing.

Grudens-Schuck, N. (2003) *No beginners: teaching participation at the graduate level*, PLA notes, 48 (12)11-14.

Guest Contributor (2018, 25 January). *Top 10 Websites for Online Education in 2018*. Retrieved from: <https://www.hiretheyouth.org/top-10-websites-online-courses-2018>. Last accessed June 16, 2019.

Gwatkin, D.R. (2000) *Health inequalities and the health of the poor: what do we know? What can we do?* Bulletin of the World Health Organisation, 78 (1) 3-18. doi: 10.1590/S0042-96862000000100002.

Haggis, T. (2006). *Pedagogies for diversity: retaining critical challenge amidst fears of 'dumbing down'*, Studies in Higher Education, 31 (5) 521-535, doi: 10.1080/03075070600922709.

Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* International Review of Education. 57. 10.1007/s11159-011-9198-8.

Hernández Sampieri, R. (2013). *Los métodos mixtos*. Retrieved from <http://www.equity-la.eu/upload/arxius/20170622222853-Hernandez.%20Metodolog%C3%ADa%20de%20invest.%20Diseños%20mixtos.pdf>. Last accessed 19 September 19, 2020.

Hew, K. F., Cheung, W.S. (2014). *Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges*. Educational Research Review, 12, 45-58. http://dx.doi.org/10.1016/j.edurev.2014.05.001.

Hew, K. (2015). *Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS: Engagement: lessons from MOOCs*. British Journal of Educational Technology. 47. 10.1111/bjet.12235.

Ibrahim M., Al-Shara O. (2007). *Impact of Interactive Learning on Knowledge Retention*. In: Smith M.J., Salvendy G. (eds) Human Interface and the Management of Information. Interacting in Information Environments. Human Interface 2007. Lecture Notes in Computer Science, vol 4558. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-73354-6_38.

Imran, A., Yusoff, R.M. (2015). *Empirical Validation of Qualitative Data: A Mixed Method Approach.* International Journal of Economics and Financial Issues, 5, 389-396.

Ivanic, R. (2000). *Negotiation, process, content and participants' experience in a process syllabus for ELT professionals*, In Breen, M.P. and Littlejohn, A. (eds) Classroom decision-making: negotiation and process syllabuses in practice, Cambridge: Cambridge University Press.

Jacoby, J. (2014). *The disruptive potential of the massive open online course: A literature review.* Journal of Open, Flexible and Distance Learning, 18(1), 73-85. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1079845.pdf>. Last accessed May 4, 2021.

Kahn, P., O' Rourke, K. (2005). In Barrett, T., MacLabhrainn, I. and Fallon, H. (Eds). *Handbook of enquiry and problem-based learning. Irish case studies and international perspectives, All Ireland Society for Higher Education. Online.* Retrieved from <http://www.aishe.org/readings/2005-2/contents.html>. Last accessed May 4, 2021.

Kennedy E., Laurillard D. (2019a, February 28). *A MOOC value creation methodology.* Retrieved from: <https://www.researchcghe.org/events/cghe-seminar/a-mooc-value-creation-methodology/>. CGHE (Centre for global Higher Education). Last accessed October 18, 2020.

Kennedy E., Laurillard D. (2019b). *A MOOC value creation methodology*. Retrieved from: <https://www.researchcghe.org/perch/resources/view-the-presentation-2.pdf>. CGHE (Centre for global Higher Education). Last accessed October 18, 2020.

Kennedy, J. (2014). *Characteristics of massive open online courses (MOOCs): A research review, 2009-2012.* Joournal of Interactive Online Learning, 13(1), 1-16.

Kenton (2019, June 27). *Types of descriptive statistics.* Retrieved from: <https://baselinesupport.campuslabs.com/hc/en-us/articles/204305665-Types-of-Descriptive-Statistics>. Last accessed September 20, 2020.

Ketelhut, D.J., Niemi, S. (2007). *Emerging Technologies in Education and Training: Applications for the Laboratory Animal Science Community*, ILAR Journal, Volume 48, Issue 2, 2007, Pages 163–169, https://doi.org/10.1093/ilar.48.2.163.

Kohn L, Christiaens W. (2012). *The use of Qualitative Research Methods in KCE studies.* Method. Brussels: Belgian Health Care Knowledge Centre (KCE). KCE Report 187C. D/2012/10.273/68.

Kolb, D.A. (1984). *Experiential learning: experience as the source of learning and development*, New Jersey: Prentice-Hall.

Kovanović, V. et al. (2015). *What public media reveals about MOOCs: A systematic analysis of new reports*. British Journal of Educational Technology, 46(3), 510-527, doi: https://doi.org/10.1111/bjet.12277.

Kuh, G. (2008). *High-impact educational practices*. Washington, DC: Association of American Colleges and Universities. Retrieved from < https://provost.tufts.edu/celt/files/High-Impact-Ed-Practices1.pdf>. Last accessed May 4, 2021.

Kurt, S. (2017, October 7). *Definitions of Instructional Design*. Retrieved from: <https://educationaltechnology.net/definitions-instructional-design/>. Last accessed November 13, 2020.

Lažetić, Pr., Souto,-Otero, M., Shields, R. (2015). *Open Cases: A catalogue of mini Cases on Open Education in Europe*. European Comission. Joint Research Centre. Institute for prospective technological studies.

Levin, R. (2017, May 13). *MOOCs and the Future of Higher Education Featuring Rick Levin.* Retrieved from <https://www.youtube.com/watch?v=TABDlb6eEQw&t=1922s>. Last accessed April 4, 2020.

Liyanagunawardena, T.R., Adams, A.A., Williams, S.A. (2013). *MOOCs: A systematic study of the published literature 2008-2012*. The International Review of Research in Open and Distributed Learning, 14(3), 202-227.

Liyanagunawardena, T.R., Lundqvist, K., Mitchell, R.J., Warburton, S., Williams, Sh. (2019). *A MOOC Taxonomy Based on Classification Schemes of MOOCs*. European Journal of Open, Distance and E-Learning. 22. 85-103. 10.2478/eurodl-2019-0006.

Lucky R. W. (2019, September). *The expiration date of knowledge.* Retrieved from: <https://read.nxtbook.com/ieee/spectrum/spectrum_na_september_2019/the_expiration_date_of_knowle.html>. Last accessed October 31, 2020.

Mackness, J., Mak, S., Williams, R. (2010). *The ideals and reality of participating in a MOOC.* 7th International Conference on Networked Learning 2010. Retrieved from <https://researchportal.port.ac.uk/portal/files/108952/The_Ideals_and_Realilty_of_Participating_in_a_MOOC.pdf>. Last accessed on May 10, 2018.

Marton, F., Saljo, R. (1997). *Approaches to Learning*, in F. Marton, D. Hounsell & N. Entwistle (Eds) The experience of learning: implications for teaching and studying in Higher Education (2nd edn) (Edinburgh: Scottish Academic Press).

Martyn, E. (2000). *Syllabus negotiation in a school of nursing*, In Breen, M.P. and Littlejohn, A. (eds) Classroom decision-making: negotiation and process syllabuses in practice, Cambridge: Cambridge University Press.

McBride, M. (2017). *Learning Platforms & Going Mobile. What are the options? Virtual Learning Environments ePortfolios Web 2.0 technologies Mobile technologies.* Retrieved from <https://slideplayer.com/slide/6841667/>. Last accessed April 14, 2021.

McKinney, K. Jarvis, P., Creasey, G., Herrmann, D. (2010). *A range of student voices in the scholarship of teaching and learning*, in C. Werder & M. Otis (Eds) Engaging student voices in the study of teaching and learning. Virginia: Stylus.

Merrill, D., Drake, L., Lacy, Marc J., Pratt Jean & the ID2 Research Group (1996). *Reclaiming Instructional Design.* Utah State University Educational Technology 1966, 36 (5), 5-7.

Mezirow, J. (2000). *Learning to think like an adult. Core concepts of transformation theory*, In Mezirow, J. (ed) Learning as transformation. Critical perspectives on a theory in progress, San Francisco: Jossey Bass. Retrieved from <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.463.1039&rep=rep1&type=pdf>. Last accessed May 4, 2021.

Mihans, R., Long, D., Felten, P. (2008). *Power and expertise: Student–faculty collaboration in course design and the scholarship of teaching and learning.* International Journal for the Scholarship of Teaching and Learning, 2(2), 1–9.

Monson T. (2017, April 26). *Online vs Blended Learning Courses: Which are right for you?* Retrieved from: <https://elearningindustry.com/online-vs-blended-learning-courses-which-right-you>. Last accessed October 31, 2020.

Neary, M. (2012). *Student as Producer: Research-Engaged Teaching and Learning at the University of Lincoln*. User's guide 2011-2012. England. University of Lincoln. Retrieved from https://cpb-eu-w2.wpmucdn.com/blogs.lincoln.ac.uk/dist/e/185/files/2010/11/user-guide-2012.pdf. Last accessed May 4, 2021.

Neumann, Y. (2013, March 8). *Can MOOCs become part of best practices in online learning?* TOURO-University Worldwide. Retrieved from http://www.tuw.edu/content/school-news/can-moocs-become-part-of-best-practices-in-online-learning/. Last accessed May 6, 2018.

Nicol, D. (2008) *Assessment as a driver for transformational change* in HE, ESCalate newsletter Number 10 Spring. Online. Retrieved from <http://escalate.ac.uk/4451>. Last accessed June 2, 2008.

NGO, Ch. (2020, April 1). *10 Best Free and Affordable Platforms for Online Courses.* Retrieved from https://www.reviews.com/mooc-platforms/. Last accessed November 28, 2020.

Northwestern University (n.d.). *MOOC Creation Guidelines*. Retrieved from https://www.northwestern.edu/provost/docs/MOOC_Creation_Guidelines.pdf. Last accessed April 16, 2020.

Odom, S. Glenn, B., Sanner, S., Cannella, A.S. (2009). *Group Peer Review as an Active Learning Strategy in a Research Course*. International Journal of Teaching and Learning in Higher Education. 2009, Volume 21, Number 1, 108-117. Retrieved from https://files.eric.ed.gov/fulltext/EJ896250.pdf. Last accessed April 20, 2020.

OECD (2012, May 21). *Better Skills, Better Jobs, Better Lives: A Strategic Approach to Skills Policies,* OECD Publishing. <http://dx.doi.org/10.1787/9789264177338-en >. Last accessed October 31, 2020.

Ogilvie, A. (2017, July 24). *The power of student co-creation in MOOCs*. Retrieved from https://www.linkedin.com/pulse/power-student-co-creation-moocs-alison-ogilvie. Last accessed November 29, 2020.

O'Loughlin, M. (1995). *Daring the imagination: Unlocking voices of dissent and possibility in teaching. Theory Into Practice*. 34. 107-116. 10.1080/00405849509543667.

Peng, R. (2013, November 22). *Simply Statistics interview with Daphne Koller*, Co-Founder of Coursera. Retrieved from: <https://simplystatistics.org/2013/11/22/simply-statistics-interview-with-daphnekoller-co-founder-of-coursera/>. Last accessed May 10, 2018.

Raudys, J. (2018, April 17). *8 Active Learning Strategies and Examples*. Retrieved from: <https://www.prodigygame.com/blog/active-learning-strategies-examples/>. Last accessed June 29, 2020.

Reich, J. (2014, December 8). *MOOC completion and retention in the context of student intent*. EDUCAUSE Review. Retrieved from <https://er.educause.edu/articles/2014/12/mooc-completion-and-retention-in-the-context-of-student-intent>. Last accessed May 4, 2021.

Reviews (2018, December 11). *The Best MOOC Platforms*. Retrieved from: <https://www.reviews.com/mooc-platforms/>. Last accessed June 16, 2019.

Reynolds, M., Sclater, M., Tickner, S. (2004). *A critique of participative discourses adopted in networked learning,* EQUEL Symposium and Papers presented at the Networked Learning 2004 Conference, Lancaster University, April 5-7.

Rice, C.D. (2004). *Enlightened universities: beyond political agendas*, Edinburgh: Policy Institute Series: Society No. 4.

Rice, J. (2013). *What I learned in MOOC.* College Composition and Communication*, 64*(4), 695–703. Retrieved from http://www.jstor.org/stable/43490787.

Rodrigues, A. Fonseca, B., Preguiça N. (2018). *Collaboration and Technology*. 24th International Conference, CRIWG 2018 Costa de Caparica, Portugal, September 5-7, 2018 Portugal. Proceedings. Springer.

Rodriguez, O. (2012). *MOOCs and the AI-Stanford like courses: two successful and distinct course formats for Massive Open Online Courses*. European Journal of Open, Distance, and E-Learning. Retrieved from http://www.eurodl.org/materials/contrib/2012/Rodriguez.pdf. Last accessed April 19, 2018.

Rogers, C., Freiberg, H.J. (1969). *Freedom to learn*, (3rd ed.) New York: Macmillan Publishing.

Rudduck, J., Fielding, M. (2006). *Student Voice and the Perils of Popularity*. Educational Review - EDUC REV. 58. 219-231. 10.1080/00131910600584207.

SAGE Publications (2019). *What is Educational Research?* Retrieved from: <https://www.sagepub.com/sites/default/files/upm-binaries/89873_Chapter_1_What_Is_Educational_Research.pdf>. Last accessed August 29, 2020.

Saks, K., Leijen, Ä. (2014). *Distinguishing Self-Directed and Self- Regulated Learning and Measuring them in the E-learning Context.* International Conference on Education & Educational Psychology 2013 (ICEEPSY 2013). Retrieved from < https://core.ac.uk/download/pdf/82406104.pdf>. Last accessed May 4, 2021.

Samuels, O. (2016). *An In-Depth Guide To Choosing The Best Online Learning Sites*. todoistblog. Retrieved from: <https://blog.todoist.com/2016/04/22/guide-to-online-learning-sites/>. Last accessed on May 20, 2018.

Sanders, E.B.-N., Stappers, P.J. (2008). *Co-creation and the new landscapes of design*, CoDesign International Journal of CoCreation in Design and the Arts, 4(1), 5-18, doi:10.1080/15710880701875068.

Save the children. Monitoring, Evaluation, Accountability and Learning (MEAL) (n.d.). *6 Methods of data collection and analysis*. The Open University. Retrieved from: <https://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwj9jLeB2bzZAhVNGhQKHX78CCMQFggoMAA&url=http%3A%2F%2Fwww.open.edu%2Fopenlearncreate%2Fmod%2Fresource%2Fview.php%3Fid%3D52658&usg=AOvVaw21k3QPGaJZcW6Qda3nXUUO>. Last accessed May 20, 2018.

Scandrett, E., O'Leary, T., Martinez, T. (2005). *Learning environmental justice through dialogue*, PASCAL Conference Proceedings: Making Knowledge Work. Leicester: NIACE.

Sek, Y-W., Law, Ch.-Y., Liew, T.-H., Hisham, S., Lau, S.-H., Pee, A. N. (2012). *E-assessment As A Self-test Quiz Tool: The Setting Features and Formative Use.* Published by Elsevier Ltd. Selection and/or peer-review under responsibility of JIBES University. Retrieved from < https://core.ac.uk/download/pdf/81940791.pdf>. Last accessed May 4, 2021.

Shah, D. (2016, July 19). *Class Central's Top 50 MOOCs of All Time*. Class Central. Retrieved from <https://www.class-central.com/report/top-moocs/>. Last accessed May 20, 2018.

Shah, D. (2017, July 6). *MOOCs Find Their Audience: Professional Learners and Universities.* Edsurge. Retrieved from <https://www.edsurge.com/news/2017-07-06-moocs-find-their-audience-professional-learners-and-universities>. Last accessed May 11, 2018.

Shah, D. (2017a, November 27). *Class Central Learner Survey (2017): MOOC Users Highly Educated, Have Experienced Career Benefits*. Retrieved from https://www.class-central.com/report/class-central-learner-survey-2017/. Last accessed May 11, 2018.

Shah, D. (2018a, January 20). *6 Biggest MOOCs Trends of 2017,* Website, Class central. Retrieved from <https://www.class-central.com/report/6-biggest-mooc-trends-2017/>. Last accessed May 3, 2018.

Shah, D. (2018, December 11). *By the numbers: MOOCs in 2018*. Retrieved from <https://www.classcentral.com/report/mooc-stats-2018/> Last accessed June 16, 2019.

Shah, D. (2019a, December 1). *Coursera's 2019: Year in review*. Retrieved from <https://www.classcentral.com/report/coursera-2019-year-review/>. Last accessed May 21, 2020.

Shah, D. (2019b, December 9). *EdX's 2019: Year in review.* Retrieved from <https://www.classcentral.com/report/edx-2019-year-review/>. Last accessed May 21, 2020.

Shah, D. (2019c, August 19). *Class Central's Top 100 MOCs of All Time (2019 edition)*. Retrieved from https://www.classcentral.com/report/top-moocs-2019-edition/. Last accessed July 25, 2020.

Shah, D. (2020, May 2). *How different MOOC providers are. Responding to the pandemic*. Retrieved from: <https://www.classcentral.com/report/mooc-providers-response-to-the-pandemic/>. Last accessed May 21, 2020.

Shor, I. (1992). *Empowering education*. London: University of Chicago Press.

Silva, E., Rubin, B. (2003). *Missing voices: Listening to students' experiences with school reform*. In B. Rubin & E. Silva (Eds.), Critical voices in school reform (pp. 1–7). London: RoutledgeFalmer.

SkillsYouNeed (n.d.). *Lifelong Learning*. Retrieved from: <https://www.skillsyouneed.com/learn/lifelong-learning.html>. Last accessed October 31, 2020.

Slembrouck, S. (2000). *Negotiation in tertiary education: clashes with the dominant educational culture*, In Breen, M.P. and Littlejohn, A. (eds) Classroom decision-making: negotiation and process syllabuses in practice, Cambridge: Cambridge University Press.

Sorenson, L. (2001). *College teachers and student consultants: Collaborating about teaching and learning.* In Student-assisted teaching: A guide to faculty-student teamwork, eds. J.E. Miller, J.E. Groccia, & M.S. Miller, 179–183. Bolton, MA: Anker.

Stattrek. Teach yourself statistics (n.d.). *Box plot*. Retrieved from <https://stattrek.com/statistics/charts/boxplot.aspx>. Last accessed April 17, 2020.

Steffens, K. (2015, January 13). *Competences, Learning Theories and MOOCs: Recent Developments in Lifelong Learning.* Retrieved from: <https://doi.org/10.1111/ejed.12102>. Last accessed October 31, 2020.

Stracke, C. M., Tan, E., Texeira, A., Pinto, M., Vassiliadis, B., Kameas, A., Sgouropoulou, C., Vidal, G. (2018). *Quality Reference Framework (QRF) for the Quality of Massive Open Online Courses (MOOCs).* Retrieved from <http://mooc-quality.eu/wp-content/uploads/2019/11/Quality_Reference_Framework_for_MOOCs_v11.pdf>. Last accessed February 16, 2020.

Suen, H.K. (2014). *Peer assessment for Massive Open Online Courses (MOOCs).* Retrieved from <https://www.researchgate.net/publication/272088987_Peer_assessment_for_Massive_Open_Online_Courses_MOOCs>. Last accessed July 23, 2020.

Suray, A. (2013, May 25). *Introduction to Educational Research*. Retrieved from <https://www.slideshare.net/sifatpgsr/introduction-to-educational-research-pismp>. Last accessed August 29, 2020.

Tamm, S. (2019, March 21). *Disadvantages of E-learning.* Retrieved from: <https://e-student.org/disadvantages-of-e-learning/>. Last accessed 229 July 2020.

Taylor-Massey, J (2015, January 27). *Redefining Teaching: The five roles of the online instructor*. Retrieved from <http://blog.online.colostate.edu/blog/online-teaching/redefining-teaching-the-five-roles-of-the-online-instructor/>. Last accessed October 2020.

Taylor, R., Barr, J., Steele, T. (2002). *For a radical Higher Education after postmodernism,* Maidenhead: Society for Research into Higher Education and Open University Press.

The Economist (2017, January 14). *Lifelong learning is becoming an economic imperative*. Retrieved from <https://www.economist.com/special-report/2017/01/12/lifelong-learning-is-becoming-an-economic-imperative>. Last accessed October 31, 2020.

TEAL Center Staff (2010). *Student-Centered Learning. Teaching Excellence in Adult Literacy*. Retrieved from: <https://lincs.ed.gov/sites/default/files/6%20_TEAL_Student-Centered.pdf>. Last accessed August 16, 2020.

Tsui, A.B.M. (2009). *Distinctive qualities of expert teachers*, Teachers and Teaching, 15(4) 421-439.

UCA Creative Education Network (2019a). *Writing course aims and learning outcomes*. Retrieved from <https://creativeeducationnetwork.com/course-documentation/course-aims-learning-outcomes/>. Last accessed July 11, 2020.

UCA Creative Education Network (2019b). *Writing Unit Aims and Learning Outcomes.* Retrieved from <https://creativeeducationnetwork.com/course-documentation/unit-aims-learning-outcomes/>. Last accessed July 12, 2020.

University Leadership and Management (2012). *The role of universities.* Retrieved from: <https://www.epigeum.com/downloads/ulm_accessible/uk/01_intro/html/course_files/in_2_10.html>. Last accessed August 24, 2020.

University of South Australia (2019). *How students learn. Active learning*. Retrieved from <https://lo.unisa.edu.au/mod/book/view.php?id=610988&chapterid=101290>. Last accessed April 12, 2020.

University of Utah (2015, April 23). *5 Tips for an Effective Study Group*. David Eccles School of Business. Retrieved from: < https://eccles.utah.edu/news/5-tips-for-an-effective-study-group/>. Last accessed July 4, 2020.

Van Merriënboer, J., Kester, L. (2005). *The Four-Component Instructional Design Model: Multimedia Principles in Environments for Complex Learning.* In R. Mayer (Ed.), The Cambridge Handbook of Multimedia Learning (Cambridge Handbooks in Psychology, pp. 71-94). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511816819.006.

Veletsianos, G., Shepherdson, P. (2016). *A systematic Analysis and Synthesis of the Empirical MOOC literature Published in 2013-2015.* The International Review of Research in Open and Distributed Learning, 17(2), 24. https://doi.org/10.19173/irrodl.v17i2.2448

Ventista, O.M. (2018). *Self-assessment in Massive Open Online Courses*. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/2042753018784950. Last accessed July 23, 2020.

Wiggins, G., McTighe, J. (2005). *Understanding by design* (2nd ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

Wilkinson, M., Scandrett, E. (2003). *A popular education approach to tackling environmental injustice and widening participation*, Concept, 13 (1/2) 11–16.

Wolf-Wendel, L., Ward, K., Kinzie, J. (2009). *A tangled web of terms: The overlap and unique contribution of involvement, engagement, and integration to understanding college student success*. Journal of College Student Development, 50(4), 407–428.

Wong, B.T.M. (2015). *Pedagogic orientations of MOOC platforms: influence on course delivery*, AAOU Journal, Vol. 10 No. 2, pp. 49-66. Doi: 10.1108/AAOUJ-10-02-2015-B005.

Wong, B.T.M. (2016). *Factors leading to effective teaching of MOOCs*, Asian Association of Open Universities Journal, Vol. 11 Issue: 1, pp.105-118, https://doi.org/10.1108/AAOUJ-07-2016-0023 Permanent link to this document: https://doi.org/10.1108/AAOUJ-07-2016-0023.

Wong, B.T.M., Li, K.C., Lam, H. (2015), *Motivations and deterrents to MOOC offerings*, in Wong et al. (Eds), Advancing Open and Distance Learning: Research and Practices, OUHK Press, Hong Kong, pp. 16-31.

WriteThatPhD (2017, February 19). *Fundamental beliefs of research paradigms in social sciences.* Write that PhD. Retrieved from: <https://twitter.com/WriteThatPhD/status/833325273189847040>. Last accessed August 29, 2020.

Yale, Poorvu Center for Teaching and Learning (n.d.). *Formative and Summative Assessments.* Retrieved from: < https://poorvucenter.yale.edu/Formative-Summative-Assessments>. Last accessed April 12, 2020.

Young, S. (2003, January 06). *Paradigm Accommodation in Water Pollution Assessment*. Shawnyoung.com. Retrieved from <http://www.shawnyoung.com/writing/paradigm-accommodation-in-water-pollution-assessment.php>. Last accessed August 29, 2020.

Zegarra, M. (2019, June 13). *The importance of building a professional relationship with your professor.* Retrieved from: < https://www.fnu.edu/importance-building-professional-relationship-professor/>. Last accessed June 22, 2020.

Zimmerman, B. (2002). *Becoming a Self-Regulated Learner: An Overview,Theory Into Practice*, 41:2, 64-70, DOI: 10.1207/s15430421tip4102_2.

Zhu, M., Bonk, C.J., Sari, A.R. (2018). *Instructor experiences designing MOOCs in Higher Education:* Pedagogical, resource, and logistical considerations and challenges. Online Learning, 22(4), 203-241. doi:10.24059/olj.v22i4.1495.

Appendices

The following appendices consist of the factors individual analyses that were included in the descriptive statistical analysis. Data shown are the $CAT_{50\%}$ (the index that measures the completion of more than 50% of assigned tasks), the findings of the variables identified in each of the factors and the visual diagrams and graphs that helped me to identify the factors that worked best.

Statistical tables:

Learning objectives

Appendix 1. Median

Appendix 2. Target audience

Appendix 3. Prerequisites

Appendix 4. Main aim of the course

Appendix 5. Main objectives of the course

Appendix 6. Design of learning objectives

Appendix 7. What you will learn

Appendix 8. Skills you will gain

Appendix 9. Level of the course

Organisational concept and roles

Appendix 10. Course length

Appendix 11. Language: English

Appendix 12. Transcriptions of videos: English, Spanish, Chinese

Appendix 13. Free access

Appendix 14. Knowledge area

Didactic concept and methods

Appendix 15. Workload per week

Appendix 16. Course structure

Concept for learning activities

Appendix 17. Peer assessment

Communication concept

Appendix 18. Welcoming lecture video

Appendix 19. Marketing information

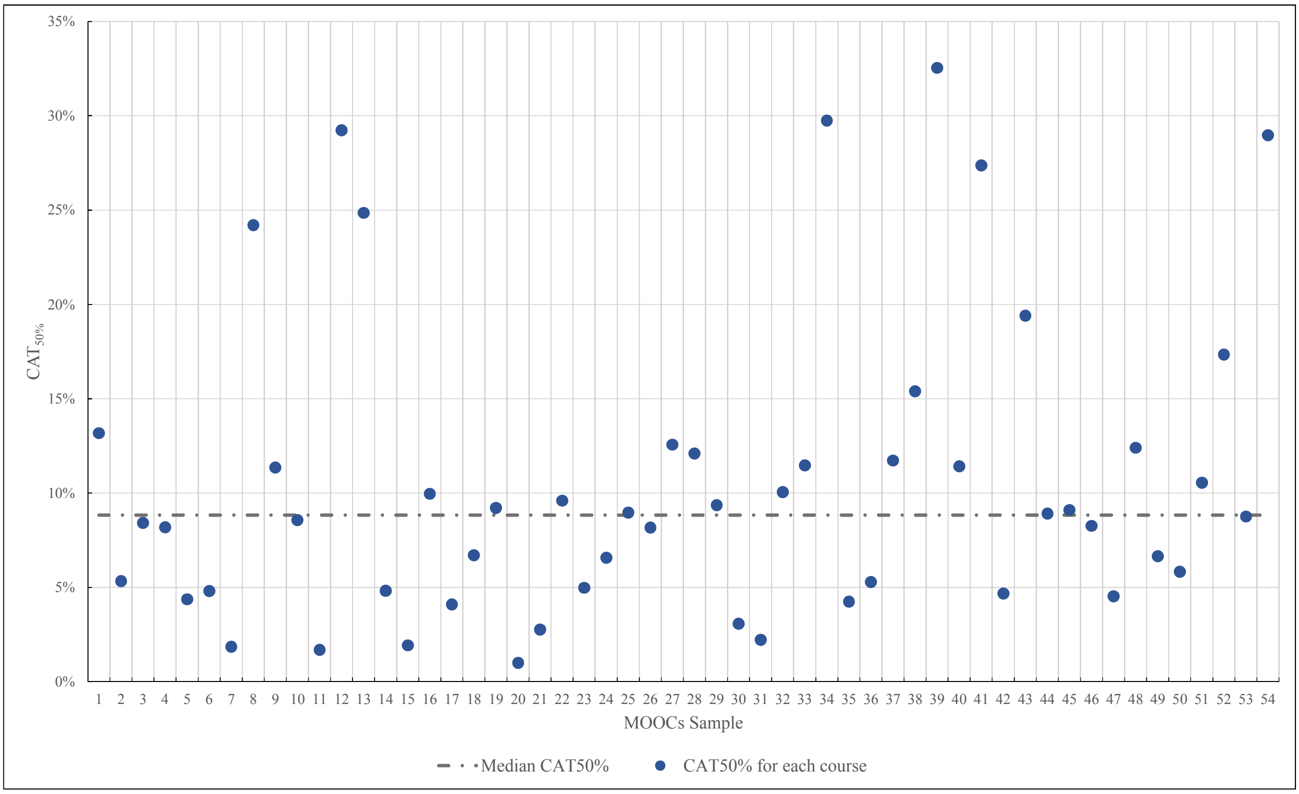
Appendix 20. Number of students already enrolled

Appendix 1. Median

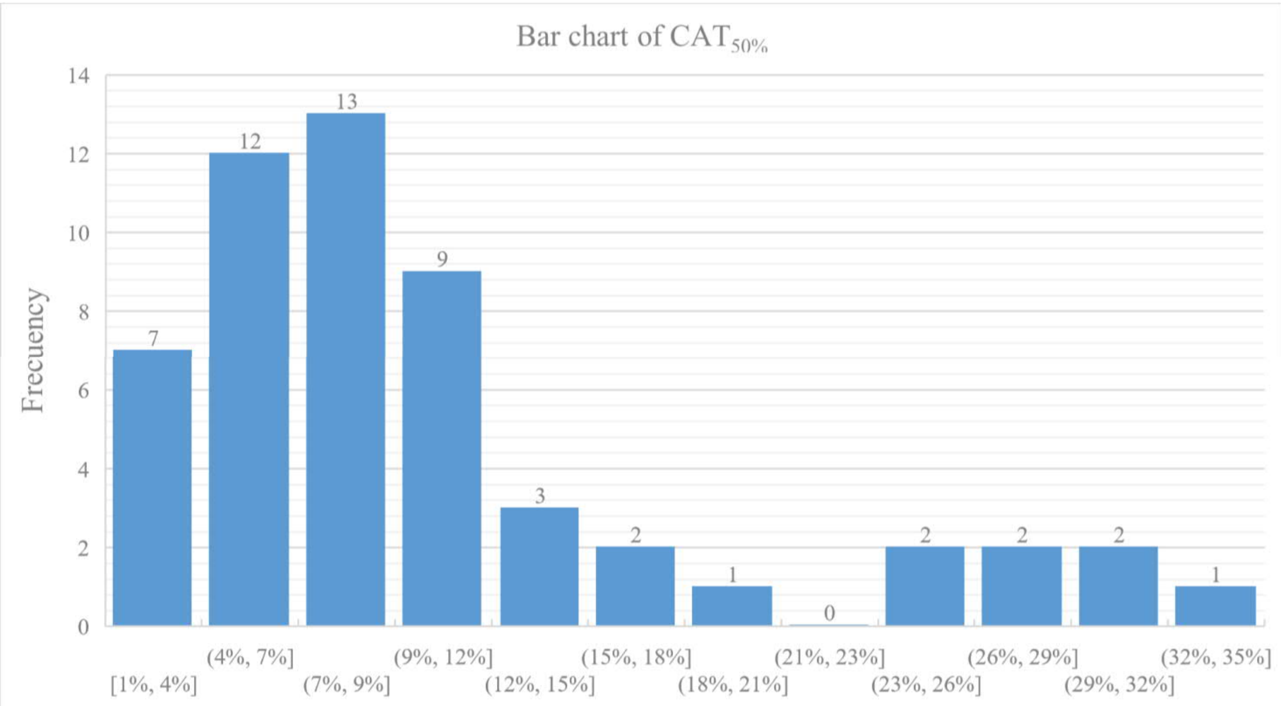
Nr.	Registra-tions	Visitors	Samplers	Auditors	Graded	Passed	% Passed	CAT50%
1	28’903	13’313	12’325	1’210	2’055	1’104	53.7	**13.18%**
2	32’049	16’018	14’074	1’101	856	527	61.6	**5.34%**
3	16’441	8’066	7’236	434	705	157	22.3	**8.42%**
4	32’243	17’891	12’420	756	1’176	619	52.6	**8.19%**
5	1’416	272	394	700	50	31	62	**4.37%**
6	4’335	1’862	2’114	240	119	16	13.4	**4.81%**
7	3’371	1’543	1’607	187	34	5	14.7	**1.86%**
8	102’900	53’772	27’138	10’099	11’891	9’132	76.8	**24.20%**
9	7’052	3’643	2’857	165	387	255	65.9	**11.35%**
10	29’588	17’061	9’714	1’739	1’074	228	21.2	**8.57%**
11	17’294	9’225	7’391	541	137	22	16.1	**1.70%**
12	135’489	50’007	48’969	11’523	24’990	19’063	76.3	**29.23%**
13	435’282	112’704	213’280	29’111	80’187	52’534	65.5	**24.86%**
14	24’147	6’767	13’509	3’033	838	470	56.1	**4.82%**
15	8’144	4’892	2’927	262	63	23	36.5	**1.94%**
16	551	240	250	30	31	9	29	**9.97%**
17	9’374	8’667	611	67	29	14	48.3	**4.10%**
18	1’341	715	361	223	42	5	11.9	**6.71%**
19	7’984	4’718	2’789	176	301	38	12.6	**9.22%**
20	2’705	1’318	1’186	187	14	1	7.1	**1.01%**
21	16’438	4’923	9’729	1’467	319	87	27.3	**2.77%**
22	11’468	6’053	4’538	357	520	99	19	**9.60%**
23	4’645	3’041	1’444	80	80	9	11.3	**4.99%**
24	78’250	37’800	34’187	3’604	2’659	269	10.1	**6.57%**
25	17’992	8’369	8’026	734	863	248	28.7	**8.97%**

26	35’987	15’210	15’360	3’719	1’698	961	56.6	**8.17%**
27	1’950	900	851	67	132	16	12.1	**12.57%**
28	8’003	3’192	3’822	407	582	242	41.6	**12.10%**
29	12’499	6’531	5’244	165	559	35	6.3	**9.37%**
30	10’359	5’844	4’123	253	139	18	12.9	**3.08%**
31	44’122	34’051	9’111	736	224	49	21.9	**2.22%**
32	63’322	30’359	25’064	4’582	3’317	909	27.4	**10.06%**
33	68’138	35’152	22’671	6’530	3’785	2’130	56.3	**11.47%**
34	58’630	22’951	21’870	3’195	10’614	7’205	67.9	**29.75%**
35	6’406	4’264	1’915	136	91	36	39.6	**4.25%**
36	23’457	9’959	12’015	769	714	374	52.4	**5.29%**
37	75’938	28’304	36’183	5’864	5’587	2’254	40.3	**11.73%**
38	81’349	30’053	37’710	5’687	7’899	2’240	28.4	**15.40%**
39	3’988	1’499	1’560	119	810	600	74.1	**32.54%**
40	4’438	1’934	1’999	219	286	159	55.6	**11.42%**
41	31’758	13’532	11’917	1’321	4’988	3’470	69.6	**27.37%**
42	201’772	78’519	103’848	13’635	5’770	4’145	71.8	**4.68%**
43	29’945	16’708	9’603	1’065	2’569	1’944	75.7	**19.41%**
44	22’407	10’820	9’872	682	1’033	780	75.5	**8.92%**
45	18’464	8’889	7’789	914	872	171	19.6	**9.11%**
46	20’468	8’810	7’861	2’833	964	289	30	**8.27%**
47	6’089	2’345	2’414	1’160	170	80	47.1	**4.54%**
48	5’571	2’122	2’681	340	428	197	46	**12.41%**
49	10’634	3’494	5’918	747	475	184	38.7	**6.65%**
50	922	579	160	163	20	-	0	**5.83%**
51	3’392	2’378	871	36	107	30	28	**10.55%**
52	28’292	13’566	10’458	1’713	2’555	1’788	70	**17.35%**
53	64’628	25’864	27’768	7’600	3’396	1’885	55.5	**8.76%**

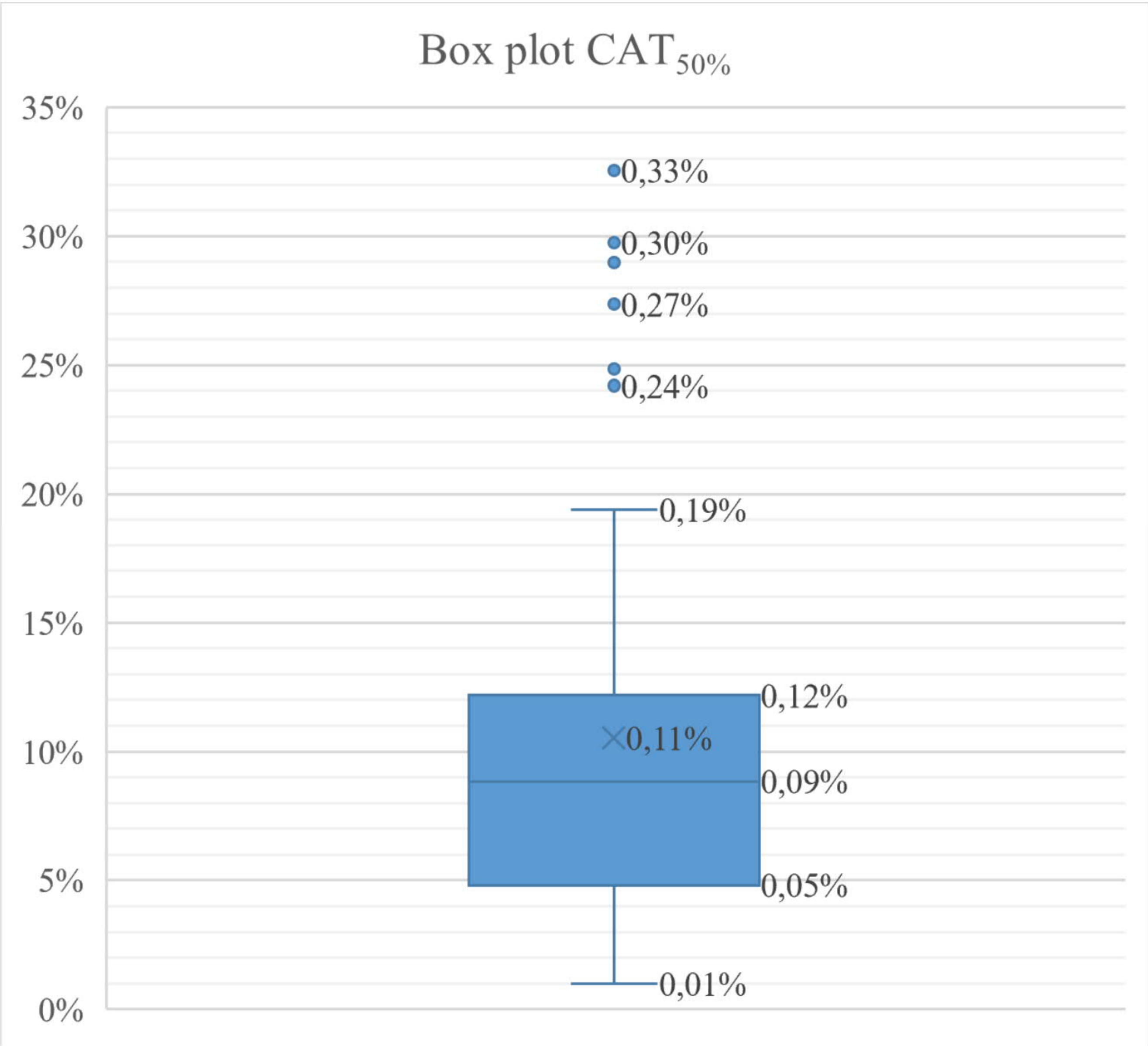
54	22’554	9’975	7’619	1’315	3’645	2’364	64.9	**28.98%**



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
CAT50% for each course



Bar chart of $CAT_{50\%}$
Frecuency
14
12
10
8
6
4
2
0
7
12
13
9
3
2
1
0
2
2
2
1
[1%, 4%]
(4%, 7%]
(7%, 9%]
(9%, 12%]
(12%, 15%]
(15%, 18%]
(18%, 21%]
(21%, 23%]
(23%, 26%]
(26%, 29%]
(29%, 32%]
(32%, 35%]


Box plot CAT$_{50\%}$
35%
30%
25%
20%
15%
10%
5%
0%
0,33%
0,30%
0,27%
0,24%
0,19%
0,12%
0,11%
0,09%
0,05%
0,01%

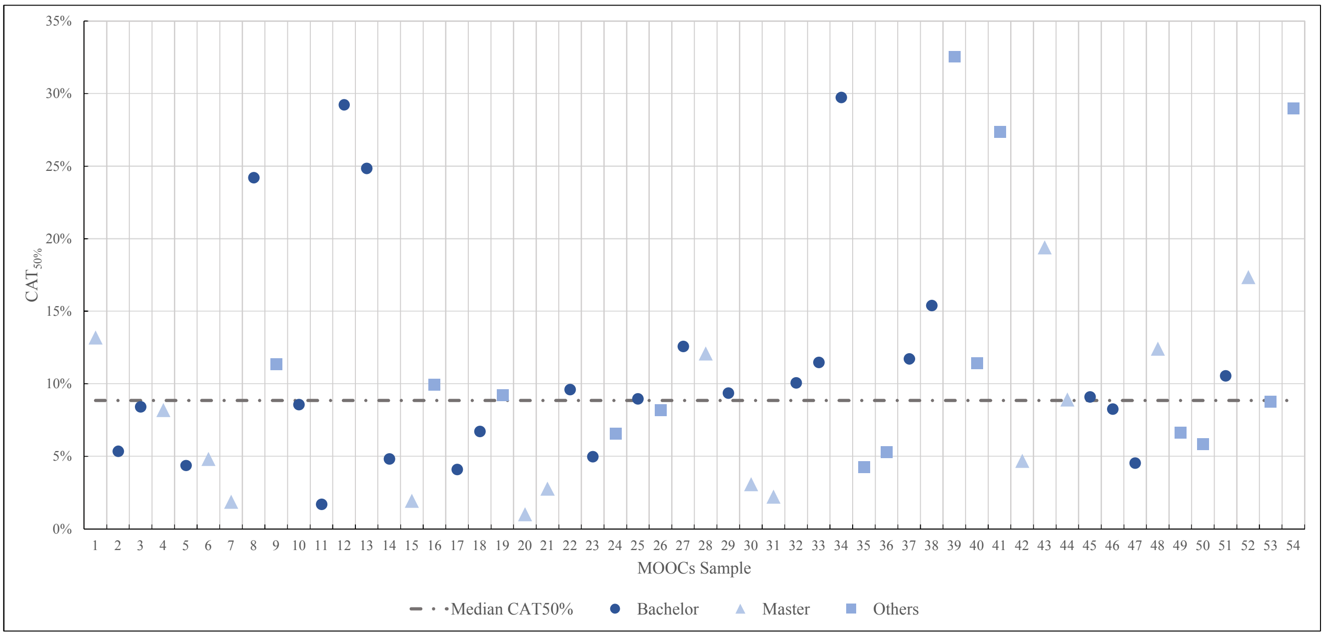
Appendix 2. Target Audience

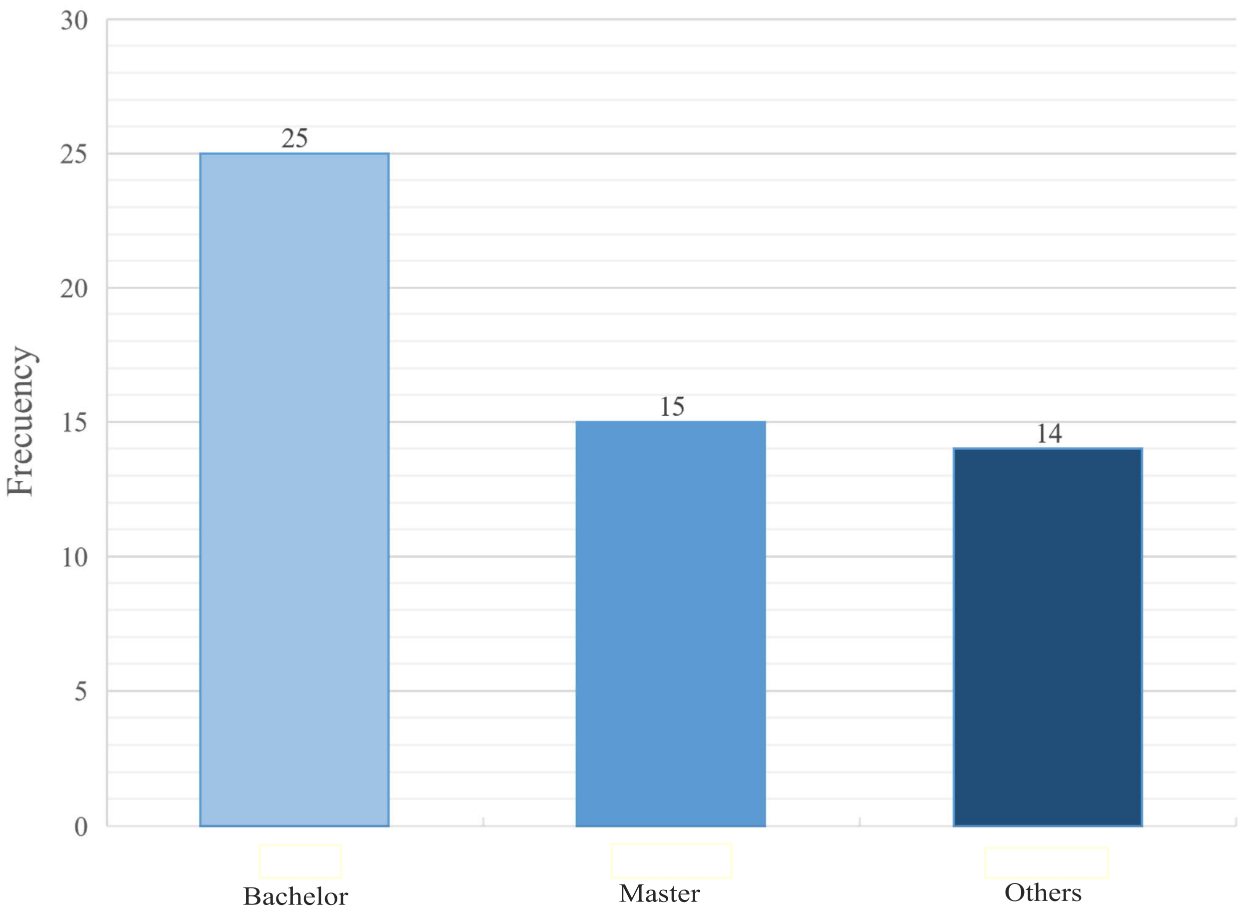
Legend:
(0) Bachelor: The MOOC is focused on an audience with knowledge of a bachelor's degree.
(1) Master: the MOOC is addressed to an audience with knowledge of master's degree.
(2) Others:
- Hors programme: "In French, this can be used in an educational context (extra courses or classes on top of the regular curriculum) or in a musical one (extra piece added to the regular programme for a given evening/concert/performance)."[1]
- Propaedeutics: "Preparatory study or instruction".[2] It is a "preparatory education" for an introductory course into an art or science.
- None.

Nr.	CAT50%	Target audience	
1	13.18%	Master	1
2	5.34%	Bachelor	0
3	8.42%	Bachelor	0
4	8.19%	Master	1
5	4.37%	Bachelor	0
6	4.81%	Master	1
7	1.86%	Master	1
8	24.20%	Bachelor	0
9	11.35%	Hors programme	2
10	8.57%	Bachelor	0
11	1.70%	Bachelor	0
12	29.23%	Bachelor	0
13	24.86%	Bachelor	0
14	4.82%	Bachelor	0
15	1.94%	Master	1
16	9.97%	None	2

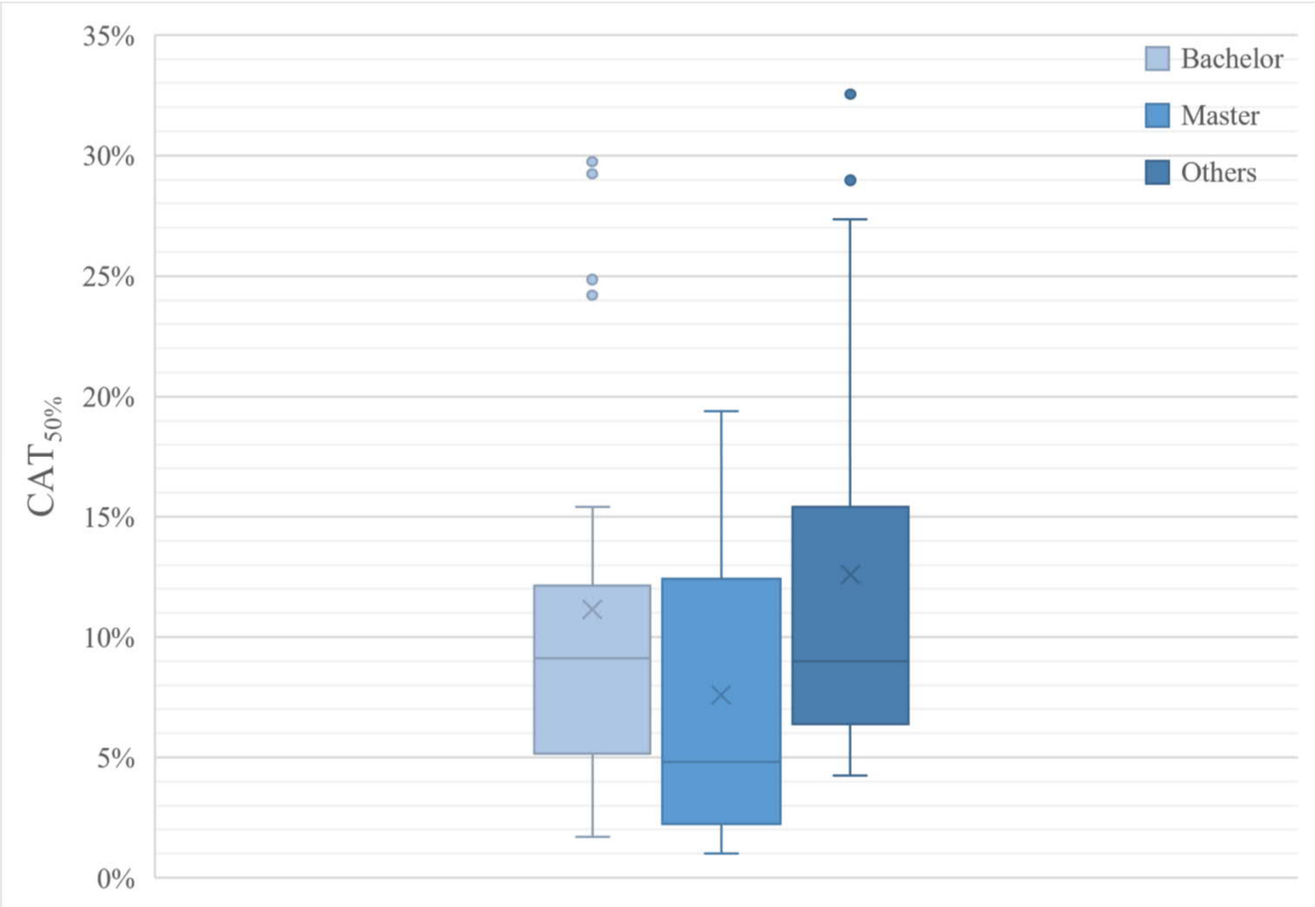
17	4.10%	Bachelor	0
18	6.71%	Bachelor	0
19	9.22%	Hors programme (extracurricular)	2
20	1.01%	Master	1
21	2.77%	Master	1
22	9.60%	Bachelor	0
23	4.99%	Bachelor	0
24	6.57%	Propedeutic	2
25	8.97%	Bachelor	0
26	8.17%	Hors programme (extracurricular)	2
27	12.57%	Bachelor	0
28	12.10%	Master	1
29	9.37%	Bachelor	0
30	3.08%	Master	1
31	2.22%	Master	1
32	10.06%	Bachelor	0
33	11.47%	Bachelor	0
34	29.75%	Bachelor	0
35	4.25%	Hors programme (extracurricular)	2
36	5.29%	Hors programme (extracurricular)	2
37	11.73%	Bachelor	0
38	15.40%	Bachrelor	0
39	32.54%	Hors programme (extracurricular)	2
40	11.42%	None	2

41	27.37%	Hors programme (extracurricular)	2
42	4.68%	Master	1
43	19.41%	Master	1
44	8.92%	Master	1
45	9.11%	Bachelor	0
46	8.27%	Bachelor	0
47	4.54%	Bachelor	0
48	12.41%	Master	1
49	6.65%	Propedeutic (a preliminary instruction or as an introduction to further study)	2
50	5.83%	Hors programme	2
51	10.55%	Bachelor	0
52	17.35%	Master	1
53	8.76%	Hors programme	2
54	28.98%	Hors programme	2


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Bachelor
Master
Others



Frecuency
30
25
20
15
10
5
0
25
15
14
Bachelor
Master
Others


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
Bachelor
Master
Others

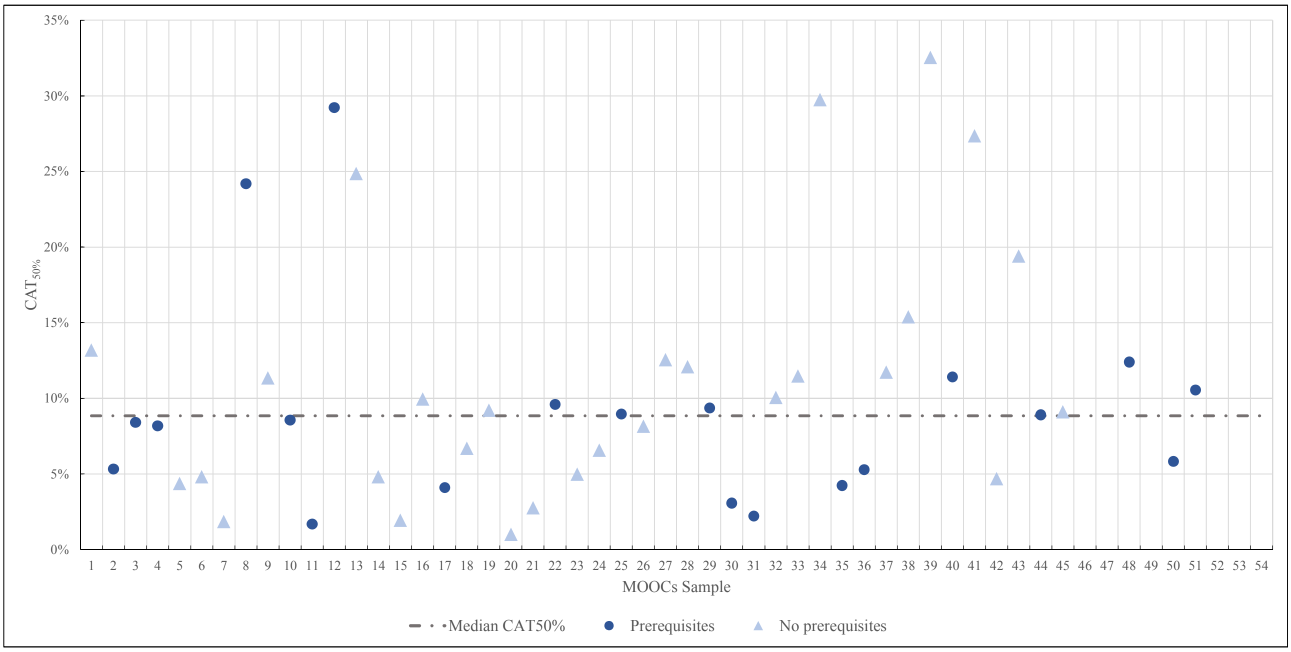
Appendix 3. Prerequisites

Legend:
(1) Yes, the MOOC has added prerequisites to access the MOOC.
(2) No, there are not any prerequisites to access.

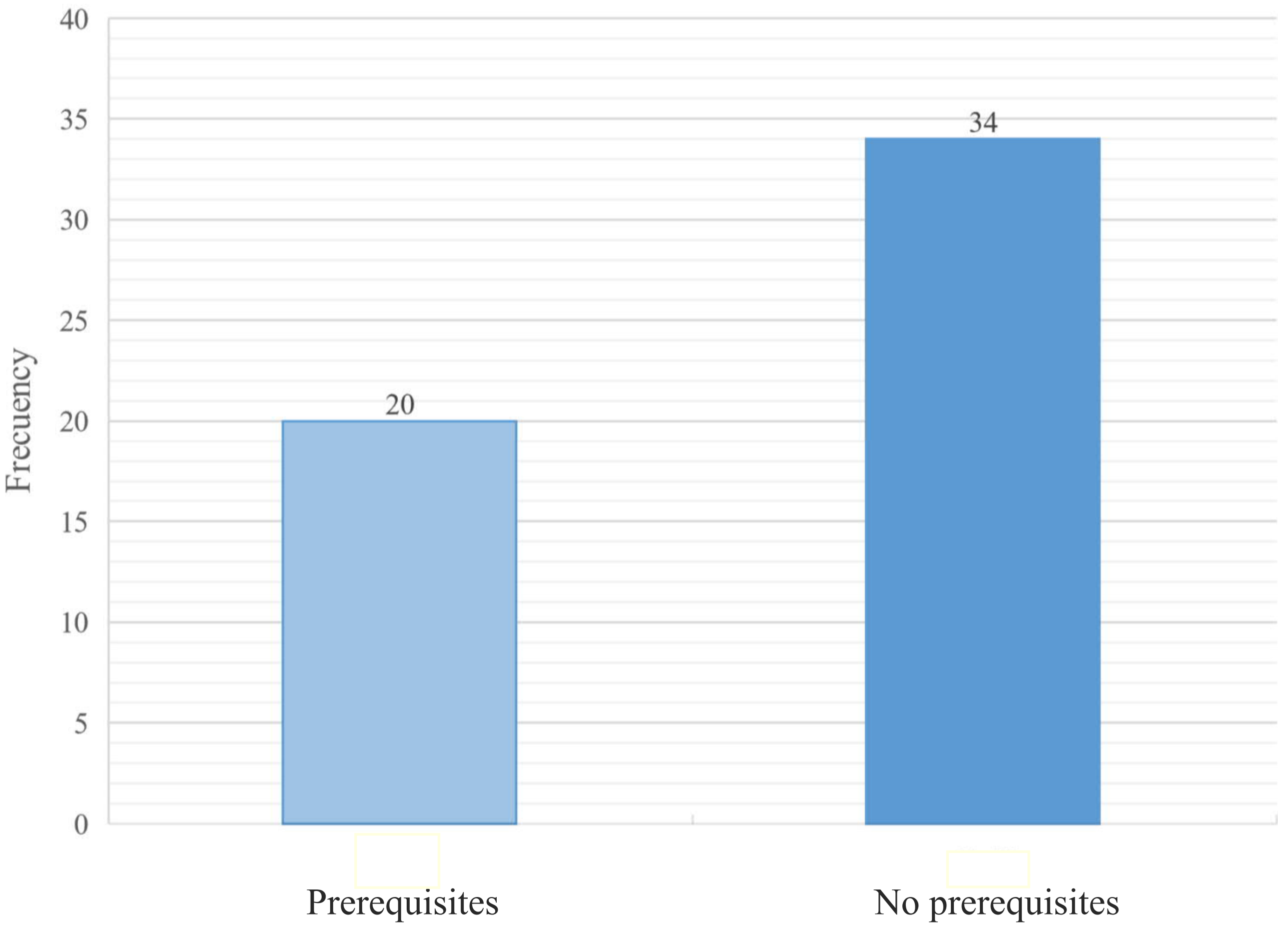
Nr.	CAT50%	Prerequisites	
1	13.18%	No prerequisites	2
2	5.34%	Physics and maths , 1st year of bachelor, developed specifics topics	1
3	8.42%	Introductory physics	1
4	8.19%	High school, 1st year university of physics, chemistriy, biology and mathematics	1
5	4.37%	No prerequisites	2
6	4.81%	No prerequisites	2
7	1.86%	No prerequisites	2
8	24.20%	Data engineers, Data scientits, machine learning engineers, Software Engineers, Data Analysts	1
9	11.35%	No prerequisites	2
10	8.57%	Prerequisites	1
11	1.70%	Prerequisites	1
12	29.23%	Prerequisites	1
13	24.86%	No prerequisites	2
14	4.82%	No prerequisites	2
15	1.94%	No prerequisites	2
16	9.97%	No prerequisites	2
17	4.10%	A basic knowledge of history of architecture and architectural design	1
18	6.71%	No prerequisites	2
19	9.22%	No prerequisites	2
20	1.01%	No prerequisites	2

21	2.77%	No prerequisites	2
22	9.60%	Basic understanding of chemistry, molecular structures, elementary reactions, chemical kinetics	1
23	4.99%	No prerequisites	2
24	6.57%	No prerequisites	2
25	8.97%	Basics in Physics and Chemistry	1
26	8.17%	No prerequisites	2
27	12.57%	No prerequisites	2
28	12.10%	No prerequisites	2
29	9.37%	Basic mathematics concepts, Basic biological concepts	1
30	3.08%	Knowledge of ordinary differential equations, Knowledge of programming in one of Python, C/C++, Java, MATLAB	1
31	2.22%	Calculus, differential equations, probabilities	1
32	10.06%	No prerequisites	2
33	11.47%	No prerequisites	2
34	29.75%	No prerequisites	2
35	4.25%	General physics (electricity and magnetism), Vector calculus, Completion of PlasmaIntroductionX recommended	1
36	5.29%	General physics (electricity and magnetism), Vector calculus	1
37	11.73%	No prerequisites	2
38	15.40%	No prerequisites	2
39	32.54%	No prerequisites	2
40	11.42%	At least one year programming experience, preferably in Scala or a functional language.	1
41	27.37%	No prerequisites	2
42	4.68%	No prerequisites	2
43	19.41%	No prerequisites	2
44	8.92%	Bachelor level courses in physics, vector analysis, and calculus.	1

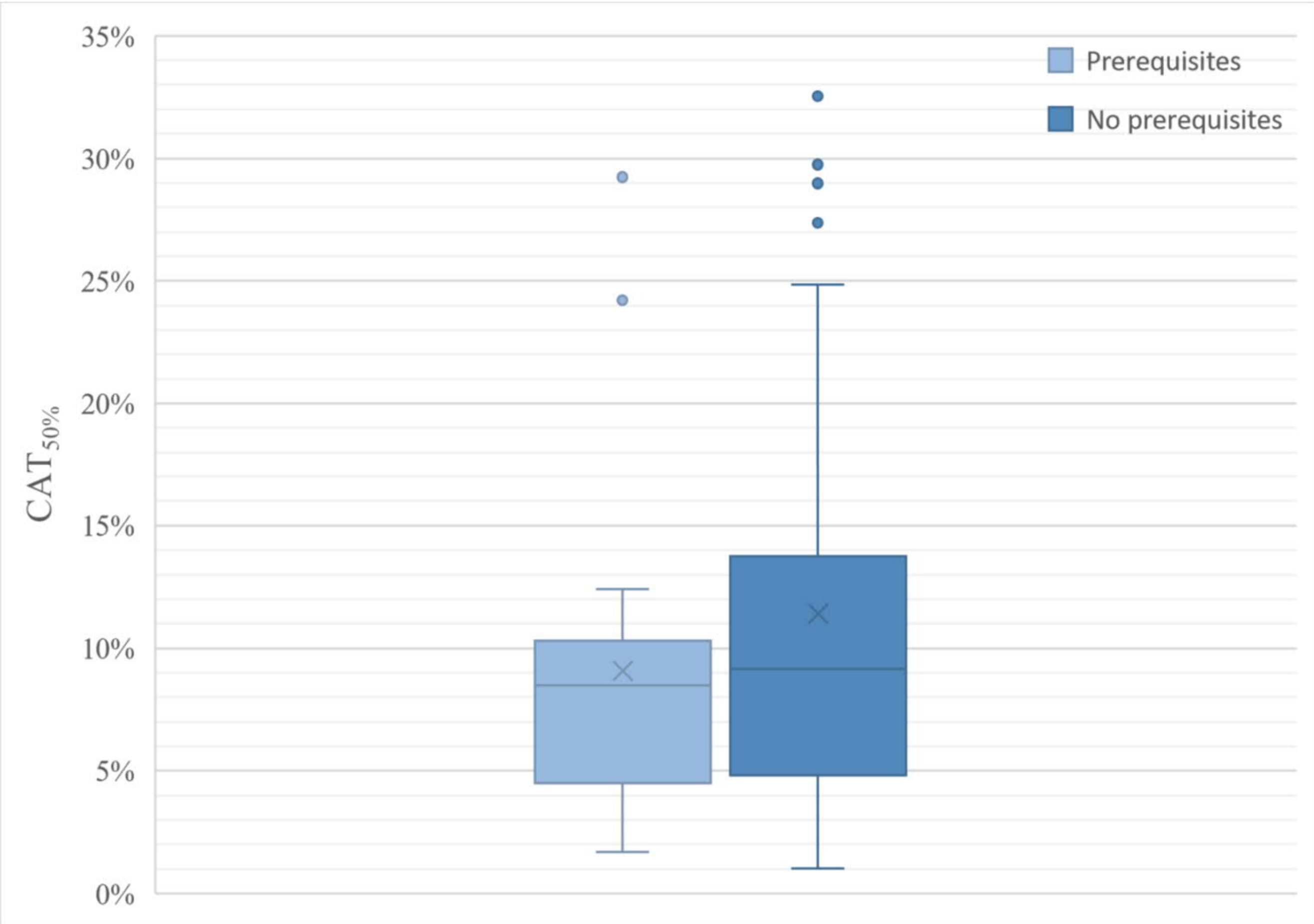
45	9.11%	No prerequisites	2
46	8.27%	No prerequisites	2
47	4.54%	No prerequisites	2
48	12.41%	1st-year undergraduate mathematical concepts	1
49	6.65%	No prerequisites	2
50	5.83%	No prerequisites	1
51	10.55%	For those who want to take part in the Underground Design Studio, basic experience is recommended	1
52	17.35%	No prerequisites	2
53	8.76%	No prerequisites	2
54	28.98%	No prerequisites	2



35%
30%
25%
20%
15%
10%
5%
0%
CAT$_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Prerequisites
No prerequisites



40
35
30
25
20
15
10
5
0
Frecuency
20
34
Prerequisites
No prerequisites


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
Prerequisites
No prerequisites

Appendix 4. Main aim of the course

Legend:

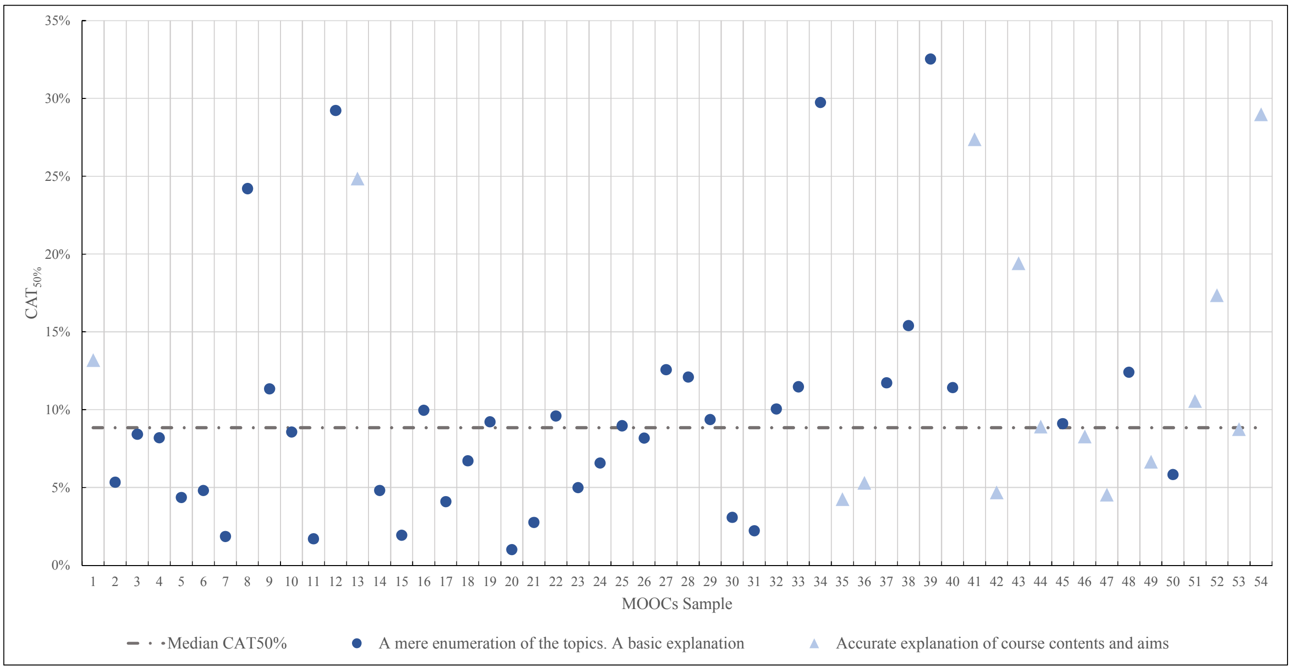
(0) About this course: A mere enumeration of the topics by academic staff. These include general information on the basic principles of the course with a basic explanation.

(1) About this course: More accurate explanation of course contents by academic staff. An overview of all the topics, but this time course aims are described more concisely with their overarching intentions, which are focused on achieving the results of the course.

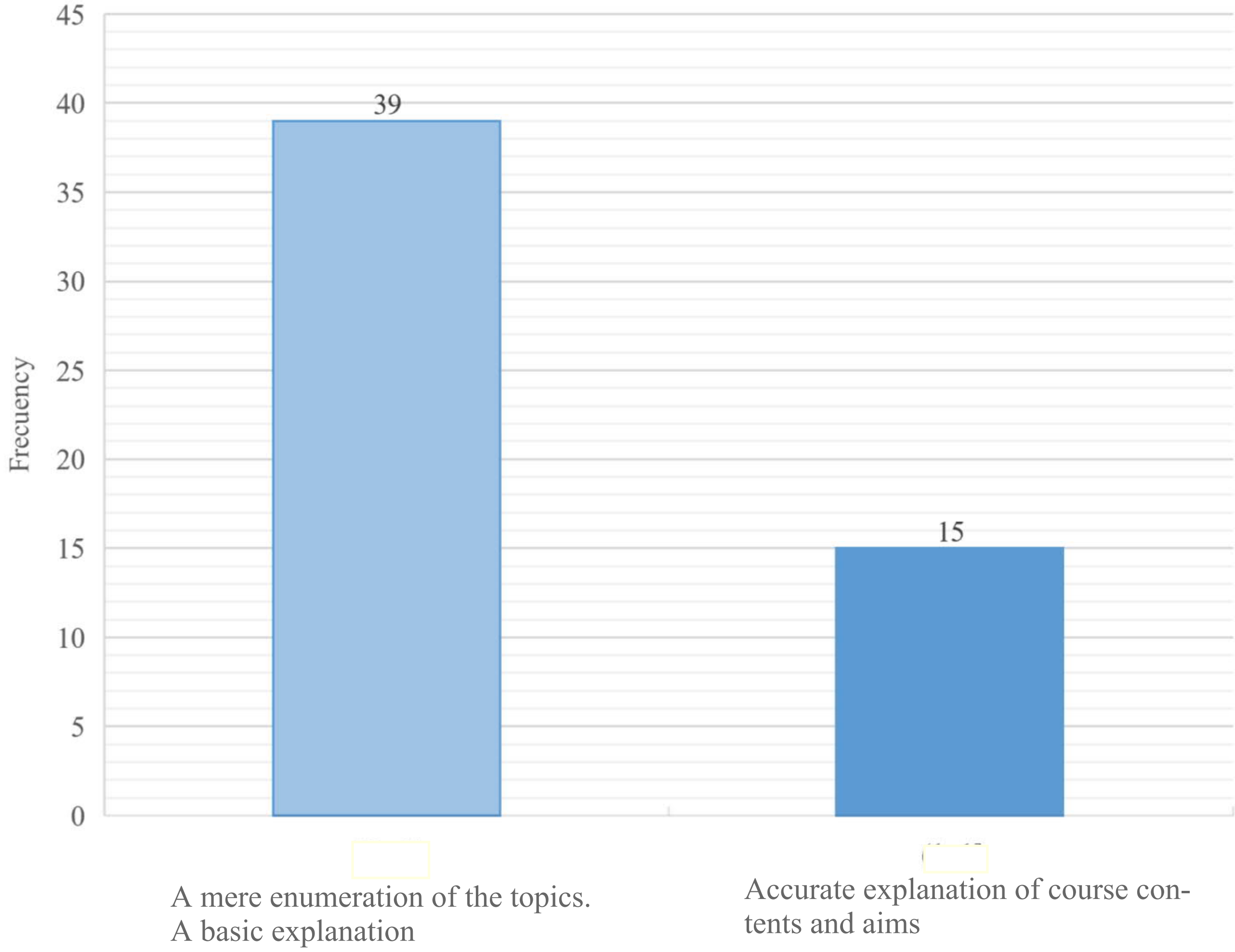
Nr.	CAT50%	Main aim of the course	
1	13.18%	Accurate explanation of course contents and aims	1
2	5.34%	A mere enumeration of the topics. A basic explanation	0
3	8.42%	A mere enumeration of the topics. A basic explanation	0
4	8.19%	A mere enumeration of the topics. A basic explanation	0
5	4.37%	A mere enumeration of the topics. A basic explanation	0
6	4.81%	A mere enumeration of the topics. A basic explanation	0
7	1.86%	A mere enumeration of the topics. A basic explanation	0
8	24.20%	A mere enumeration of the topics. A basic explanation	0
9	11.35%	A mere enumeration of the topics. A basic explanation	0
10	8.57%	About this course: basic explanation	0
11	1.70%	A mere enumeration of the topics. A basic explanation	0
12	29.23%	A mere enumeration of the topics. A basic explanation	0
13	24.86%	Accurate explanation of course contents and aims	1
14	4.82%	A mere enumeration of the topics. A basic explanation	0
15	1.94%	A mere enumeration of the topics. A basic explanation	0
16	9.97%	A mere enumeration of the topics. A basic explanation	0
17	4.10%	A mere enumeration of the topics. A basic explanation	0
18	6.71%	A mere enumeration of the topics. A basic explanation	0

19	9.22%	A mere enumeration of the topics. A basic explanation	0
20	1.01%	A mere enumeration of the topics. A basic explanation	0
21	2.77%	A mere enumeration of the topics. A basic explanation	0
22	9.60%	A mere enumeration of the topics. A basic explanation	0
23	4.99%	A mere enumeration of the topics. A basic explanation	0
24	6.57%	A mere enumeration of the topics. A basic explanation	0
25	8.97%	A mere enumeration of the topics. A basic explanation	0
26	8.17%	A mere enumeration of the topics. A basic explanation	0
27	12.57%	A mere enumeration of the topics. A basic explanation	0
28	12.10%	A mere enumeration of the topics. A basic explanation	0
29	9.37%	A mere enumeration of the topics. A basic explanation	0
30	3.08%	A mere enumeration of the topics. A basic explanation	0
31	2.22%	A mere enumeration of the topics. A basic explanation	0
32	10.06%	A mere enumeration of the topics. A basic explanation	0
33	11.47%	A mere enumeration of the topics. A basic explanation	0
34	29.75%	A mere enumeration of the topics. A basic explanation	0
35	4.25%	Accurate explanation of course contents and aims	1
36	5.29%	Accurate explanation of course contents and aims	1
37	11.73%	A mere enumeration of the topics. A basic explanation	0
38	15.40%	A mere enumeration of the topics. A basic explanation	0
39	32.54%	A mere enumeration of the topics. A basic explanation	0
40	11.42%	A mere enumeration of the topics. A basic explanation	0
41	27.37%	Accurate explanation of course contents and aims	1
42	4.68%	Accurate explanation of course contents and aims	1
43	19.41%	Accurate explanation of course contents and aims	1

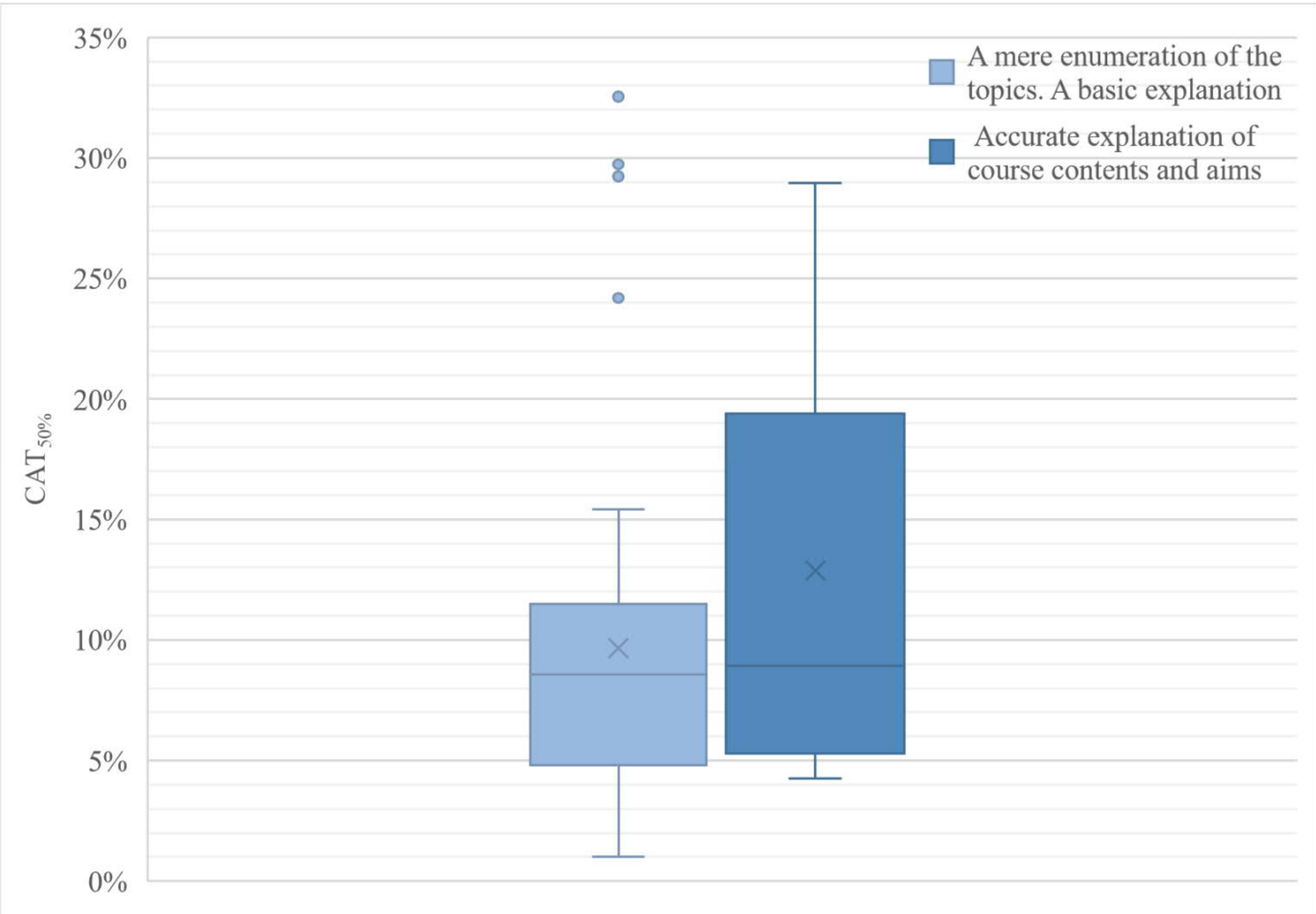
44	8.92%	Accurate explanation of course contents and aims	1
45	9.11%	A mere enumeration of the topics. A basic explanation	0
46	8.27%	Accurate explanation of course contents and aims	1
47	4.54%	Accurate explanation of course contents and aims	1
48	12.41%	A mere enumeration of the topics. A basic explanation	0
49	6.65%	Accurate explanation of course contents and aims	1
50	5.83%	A mere enumeration of the topics. A basic explanation	0
51	10.55%	Accurate explanation of course contents and aims	1
52	17.35%	Accurate explanation of course contents and aims	1
53	8.76%	Accurate explanation of course contents and aims	1
54	28.98%	Accurate explanation of course contents and aims	1



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
A mere enumeration of the topics. A basic explanation
Accurate explanation of course contents and aims



Frecuency
45
40
35
30
25
20
15
10
5
0
39
15
A mere enumeration of the topics.
A basic explanation
Accurate explanation of course con-
tents and aims


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
A mere enumeration of the topics. A basic explanation
Accurate explanation of course contents and aims

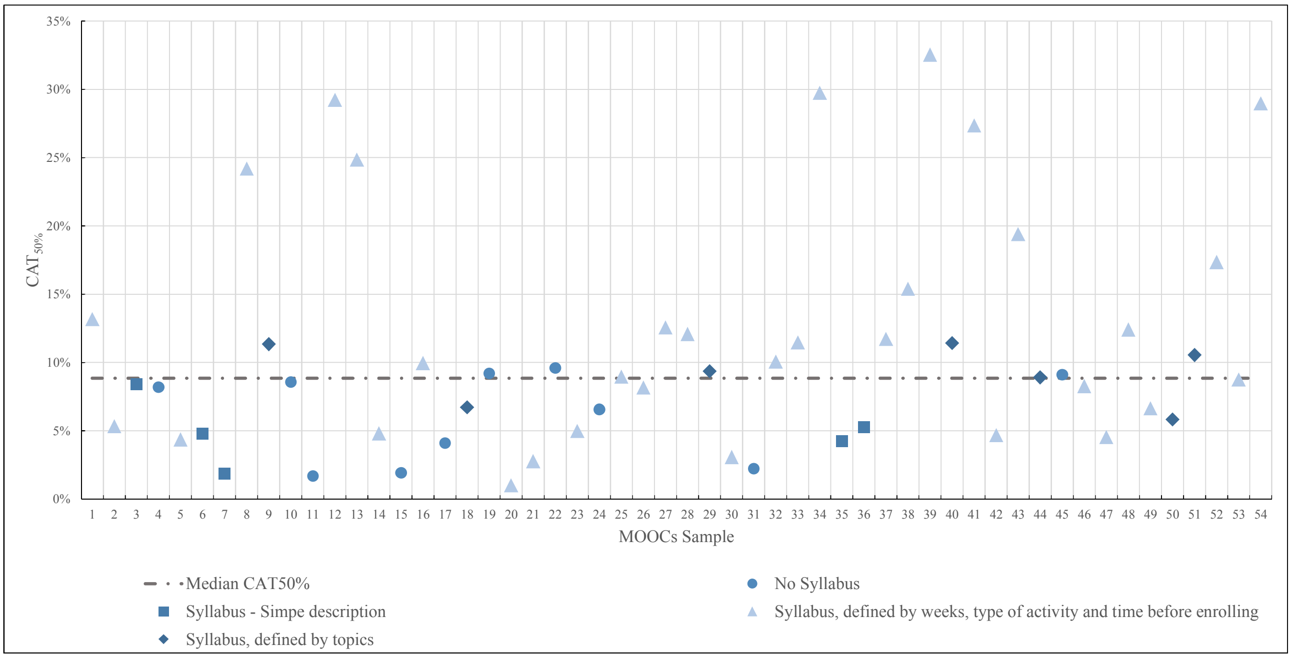
Appendix 5. Main objectives of the course

Legend:
(0) No syllabus is displayed to students in the MOOC.
(1) Syllabus. A simple description. Just a list of topics. Not organised by weeks. A simple enumeration of the topics or a list of topics organised by weeks, but very simple.
(2) Syllabus, defined by weeks, type of activity and time before enrolling in the MOOC.
(3) Syllabus, displayed a list of chapters or topics.

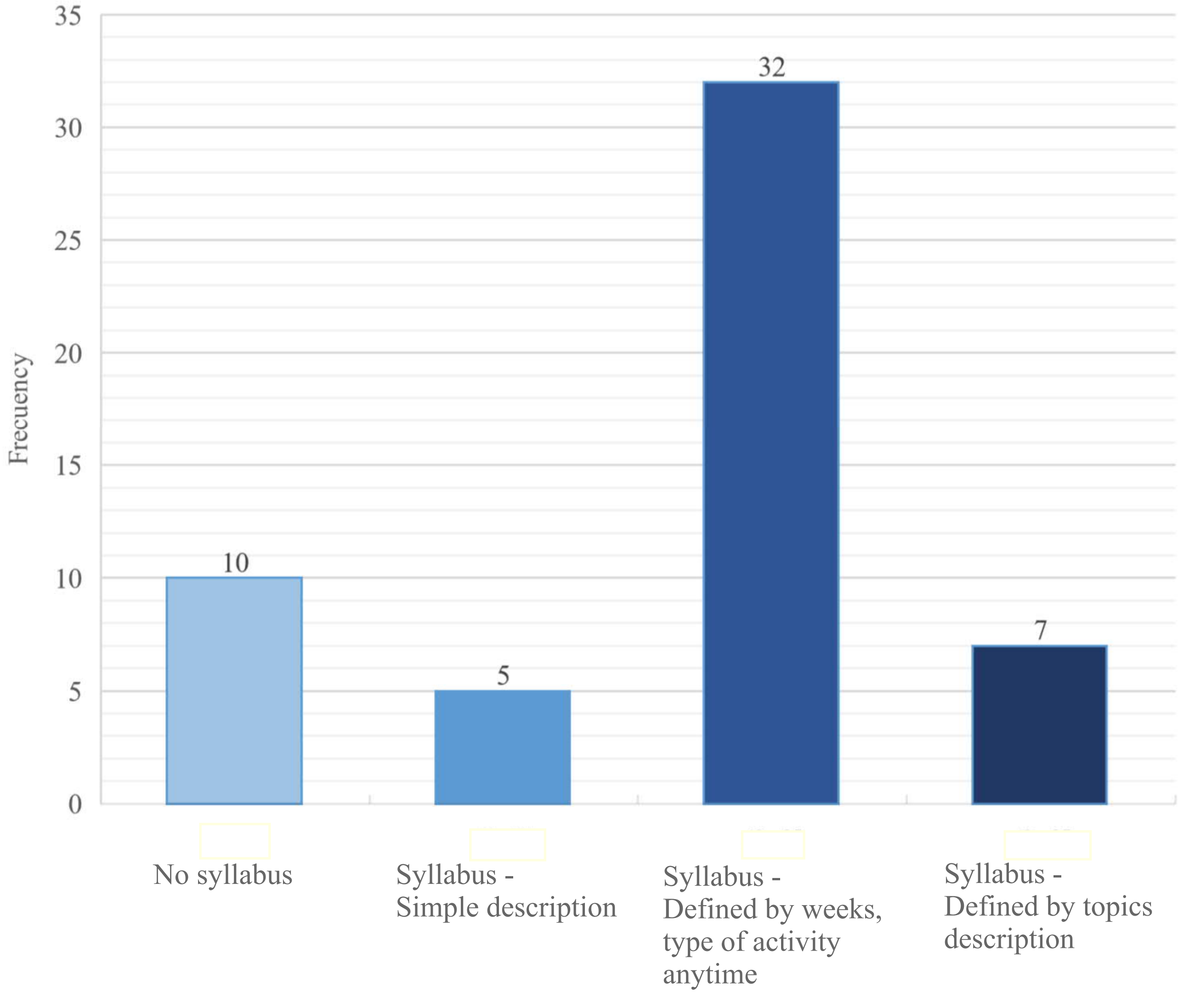
Nr.	CAT50%	Main objectives of the course	
1	13.18%	Syllabus, defined by weeks, type of activity and time before enrolling	2
2	5.34%	Syllabus, defined by weeks, type of activity and time before enrolling	2
3	8.42%	Syllabus - Simpe description	1
4	8.19%	No Syllabus	0
5	4.37%	Syllabus, defined by weeks, type of activity and time before enrolling	2
6	4.81%	Syllabus - Simpe description	1
7	1.86%	Syllabus - Simpe description	1
8	24.20%	Syllabus, defined by weeks, type of activity and time before enrolling	2
9	11.35%	Syllabus, defined by topics	3
10	8.57%	No Syllabus	0
11	1.70%	No Syllabus	0
12	29.23%	Syllabus, defined by weeks, type of activity and time before enrolling	2
13	24.86%	Syllabus, defined by weeks, type of activity and time before enrolling	2
14	4.82%	Syllabus, defined by weeks, type of activity and time before enrolling	2
15	1.94%	No Syllabus	0
16	9.97%	Syllabus, defined by weeks, type of activity and time before enrolling	2
17	4.10%	No Syllabus	0
18	6.71%	Syllabus, defined by topics	3

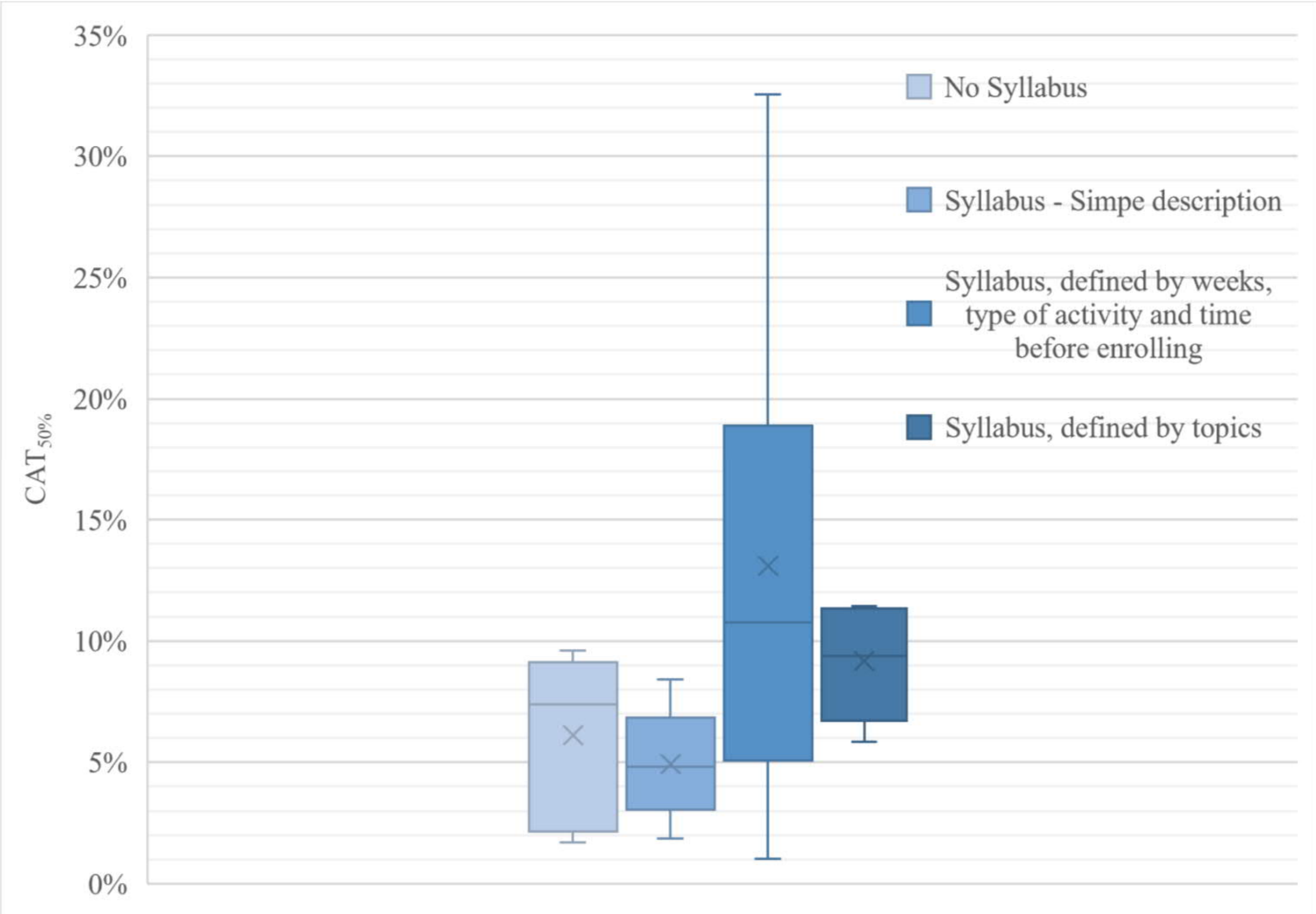
19	9.22%	No Syllabus	0
20	1.01%	Syllabus, defined by weeks, type of activity and time before enrolling	2
21	2.77%	Syllabus, defined by weeks, type of activity and time before enrolling	2
22	9.60%	No Syllabus	0
23	4.99%	Syllabus, defined by weeks, type of activity and time before enrolling	2
24	6.57%	No Syllabus	0
25	8.97%	Syllabus, defined by weeks, type of activity and time before enrolling	2
26	8.17%	Syllabus, defined by weeks, type of activity and time before enrolling	2
27	12.57%	Syllabus, defined by weeks, type of activity and time before enrolling	2
28	12.10%	Syllabus, defined by weeks, type of activity and time before enrolling	2
29	9.37%	Syllabus, defined by topics	3
30	3.08%	Syllabus, defined by weeks, type of activity and time before enrolling	2
31	2.22%	No Syllabus	0
32	10.06%	Syllabus, defined by weeks, type of activity and time before enrolling	2
33	11.47%	Syllabus, defined by weeks, type of activity and time before enrolling	2
34	29.75%	Syllabus, defined by weeks, type of activity and time before enrolling	2
35	4.25%	Syllabus - Simpe description	1
36	5.29%	Syllabus - Simpe description	1
37	11.73%	Syllabus, defined by weeks, type of activity and time before enrolling	2
38	15.40%	Syllabus, defined by weeks, type of activity and time before enrolling	2
39	32.54%	Syllabus, defined by weeks, type of activity and time before enrolling	2
40	11.42%	Syllabus, defined by topics	3
41	27.37%	Syllabus, defined by weeks, type of activity and time before enrolling	2
42	4.68%	Syllabus, defined by weeks, type of activity and time before enrolling	2

43	19.41%	Syllabus, defined by weeks, type of activity and time before enrolling	2
44	8.92%	Syllabus, defined by topics	3
45	9.11%	No Syllabus	0
46	8.27%	Syllabus, defined by weeks, type of activity and time before enrolling	2
47	4.54%	Syllabus, defined by weeks, type of activity and time before enrolling	2
48	12.41%	Syllabus, defined by weeks, type of activity and time before enrolling	2
49	6.65%	Syllabus, defined by weeks, type of activity and time before enrolling	2
50	5.83%	Syllabus, defined by topics	3
51	10.55%	Syllabus, defined by topics	3
52	17.35%	Syllabus, defined by weeks, type of activity and time before enrolling	2
53	8.76%	Syllabus, defined by weeks, type of activity and time before enrolling	2
54	28.98%	A short Syllabus organised by weeks, type of activity, and time invested	2



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
No Syllabus
Syllabus - Simpe description
Syllabus, defined by weeks, type of activity and time before enrolling
Syllabus, defined by topics


35
30
25
20
15
10
5
0
Frecuency
10
5
32
7
No syllabus
Syllabus - Simple description
Syllabus - Defined by weeks, type of activity anytime
Syllabus - Defined by topics description


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
No Syllabus
Syllabus - Simpe description
Syllabus, defined by weeks, type of activity and time before enrolling
Syllabus, defined by topics

Appendix 6. Design of learning objectives

Legend:

(0) No list of learning objectives in observed MOOCs.

(1) Simple learning objectives on a weekly basis are defined and displayed to students.

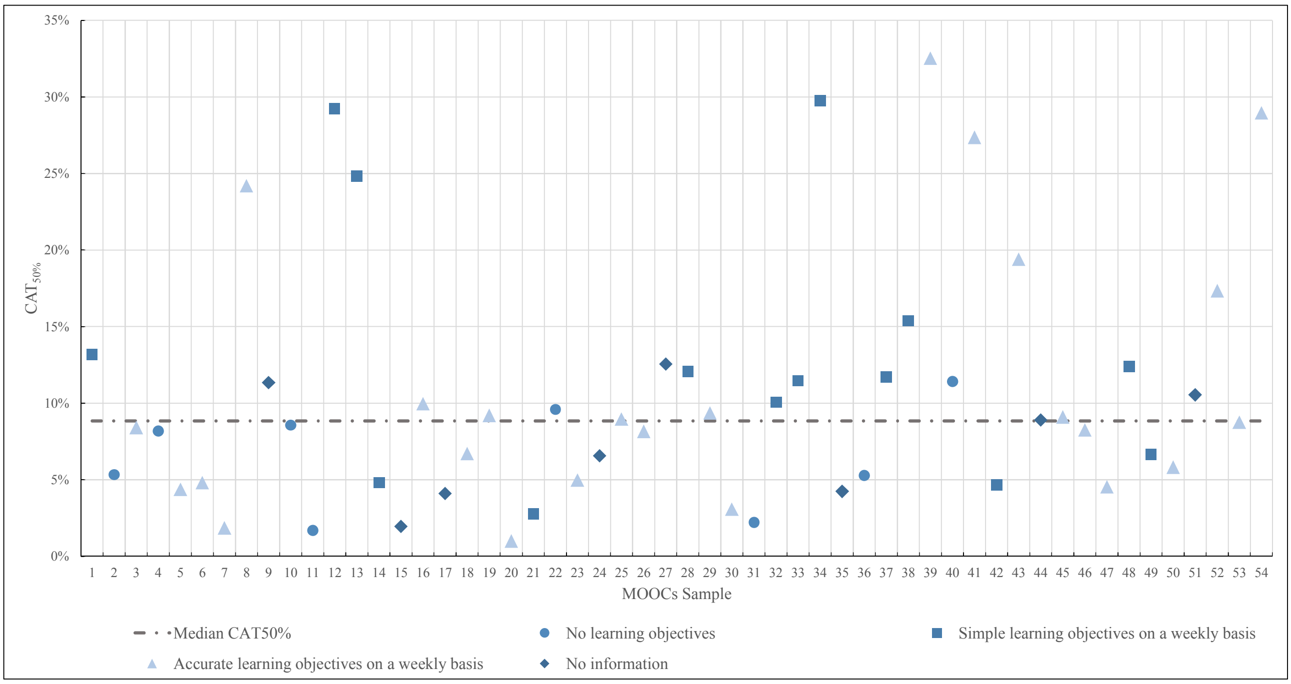
(2) Detailed and accurate learning objectives are defined on a weekly basis.

(3) There is no information related to learning objectives.

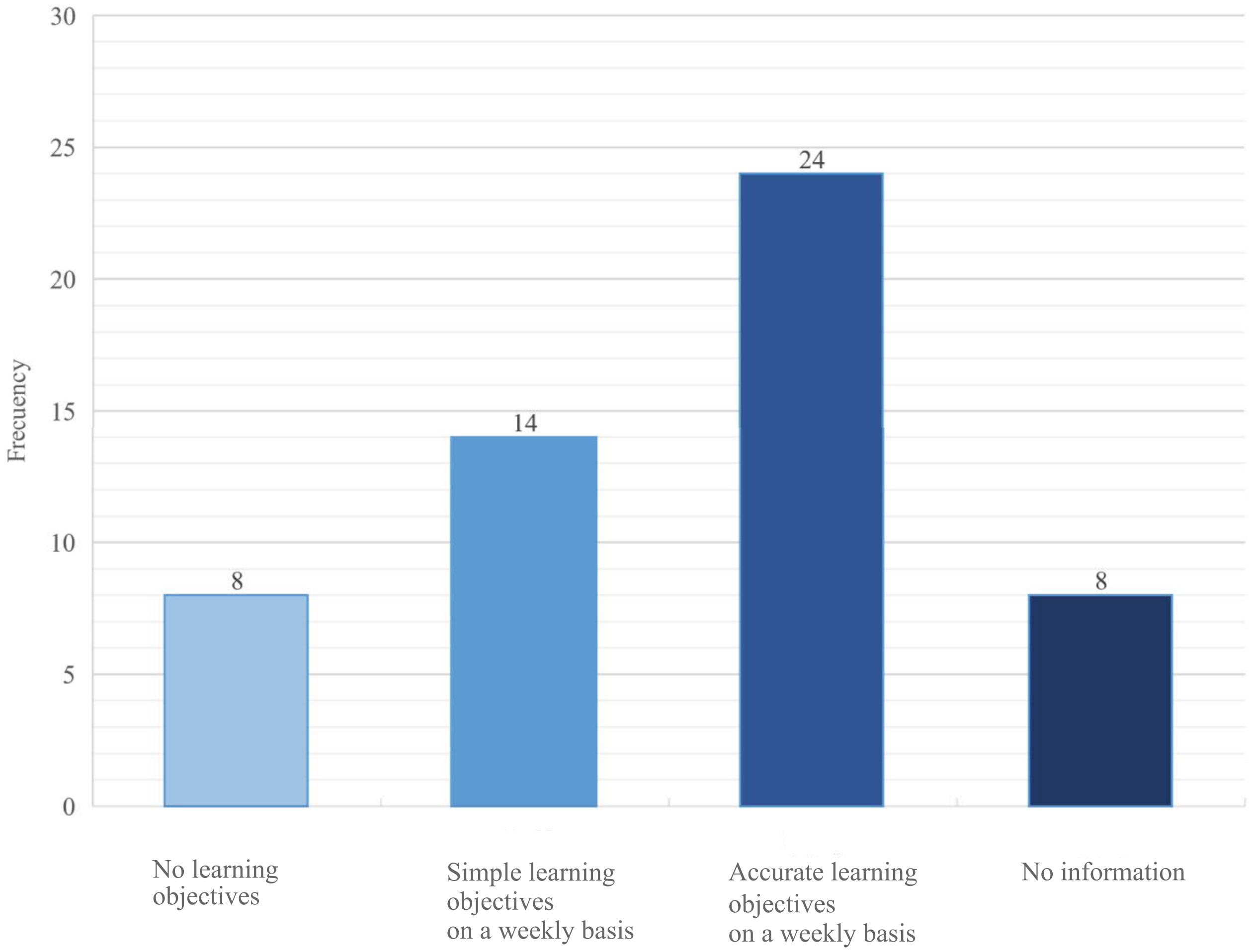
Nr.	CAT50%	Design of learning objectives	
1	13.18%	Simple learning objectives on a weekly basis	1
2	5.34%	No learning objectives	0
3	8.42%	Accurate learning objectives on a weekly basis	2
4	8.19%	No learning objectives	0
5	4.37%	Accurate learning objectives on a weekly basis	2
6	4.81%	Accurate learning objectives on a weekly basis	2
7	1.86%	Accurate learning objectives on a weekly basis	2
8	24.20%	Accurate learning objectives on a weekly basis	2
9	11.35%	No information	3
10	8.57%	No learning objectives	0
11	1.70%	No learning objectives	0
12	29.23%	Simple learning objectives on a weekly basis	1
13	24.86%	Simple learning objectives on a weekly basis	1
14	4.82%	Simple learning objectives on a weekly basis	1
15	1.94%	No information	3
16	9.97%	Accurate learning objectives on a weekly basis	2
17	4.10%	No information	3
18	6.71%	Accurate learning objectives on a weekly basis	2
19	9.22%	Accurate learning objectives on a weekly basis	2

20	1.01%	Accurate learning objectives on a weekly basis	2
21	2.77%	Simple learning objectives on a weekly basis	1
22	9.60%	No learning objectives	0
23	4.99%	Accurate Learning Objectives by week	2
24	6.57%	No information	3
25	8.97%	Accurate learning objectives on a weekly basis	2
26	8.17%	Accurate learning objectives on a weekly basis	2
27	12.57%	No information	3
28	12.10%	Simple learning objectives on a weekly basis	1
29	9.37%	Accurate learning objectives on a weekly basis	2
30	3.08%	Accurate learning objectives on a weekly basis	2
31	2.22%	No learning objectives	0
32	10.06%	Simple learning objectives on a weekly basis	1
33	11.47%	Simple learning objectives on a weekly basis	1
34	29.75%	Simple learning objectives on a weekly basis	1
35	4.25%	No information	3
36	5.29%	No learning objectives	0
37	11.73%	Simple learning objectives on a weekly basis	1
38	15.40%	Simple learning objectives on a weekly basis	1
39	32.54%	Accurate learning objectives on a weekly basis	2
40	11.42%	No learning objectives	0
41	27.37%	Accurate learning objectives on a weekly basis	2
42	4.68%	Simple learning objectives on a weekly basis	1
43	19.41%	Accurate learning objectives on a weekly basis	2

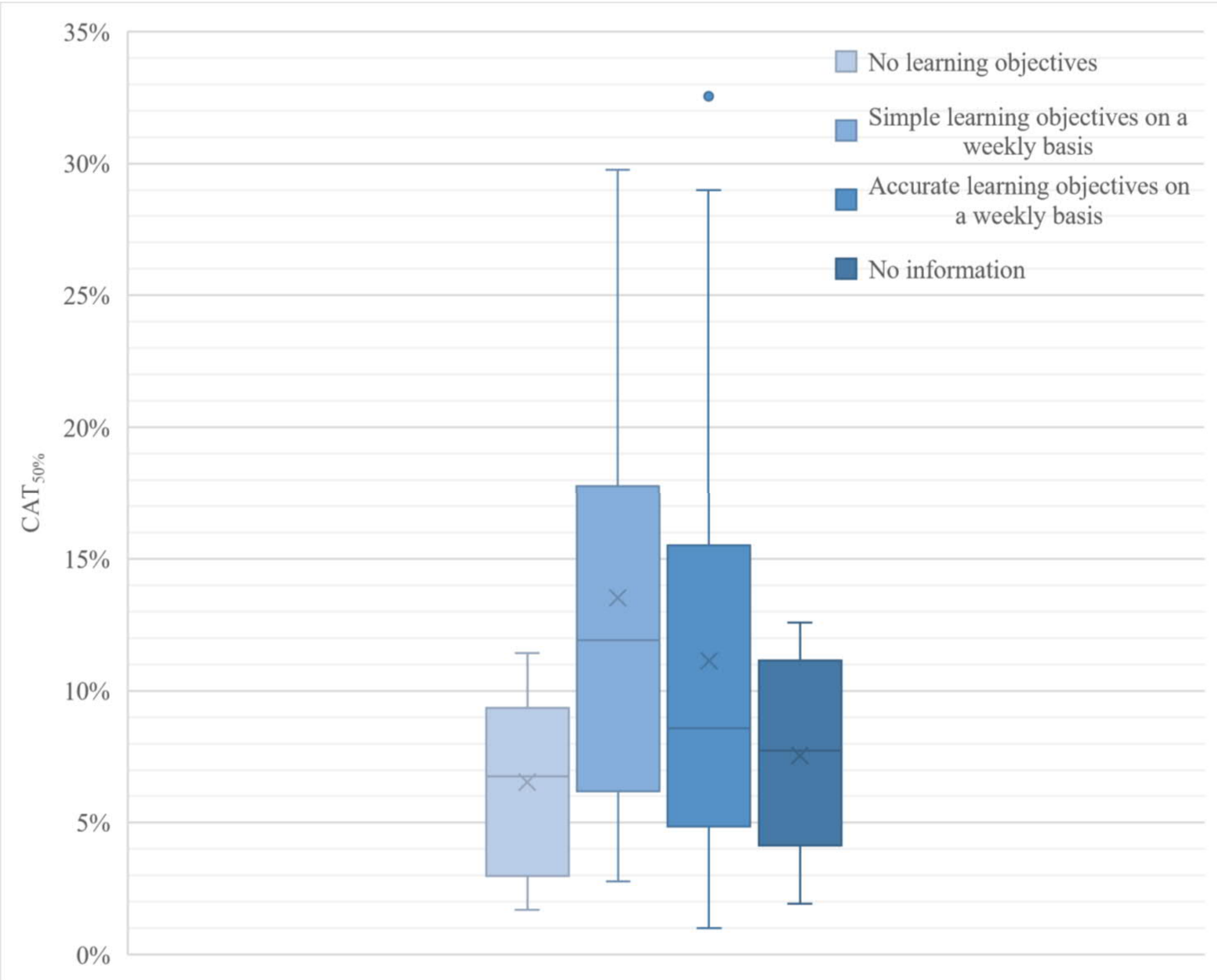
44	8.92%	No information	3
45	9.11%	Accurate learning objectives on a weekly basis	2
46	8.27%	Accurate learning objectives on a weekly basis	2
47	4.54%	Accurate learning objectives on a weekly basis	2
48	12.41%	Simple learning objectives on a weekly basis	1
49	6.65%	Simple learning objectives on a weekly basis	1
50	5.83%	Accurate learning objectives on a weekly basis	2
51	10.55%	No information	3
52	17.35%	Accurate learning objectives on a weekly basis	2
53	8.76%	Accurate learning objectives on a weekly basis	2
54	28.98%	Accurate learning objectives on a weekly basis	2



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
No learning objectives
Simple learning objectives on a weekly basis
Accurate learning objectives on a weekly basis
No information



30
25
20
15
10
5
0
Frecuency
8
14
24
8
No learning objectives
Simple learning objectives on a weekly basis
Accurate learning objectives on a weekly basis
No information



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
No learning objectives
Simple learning objectives on a weekly basis
Accurate learning objectives on a weekly basis
No information

Appendix 7. What you will learn

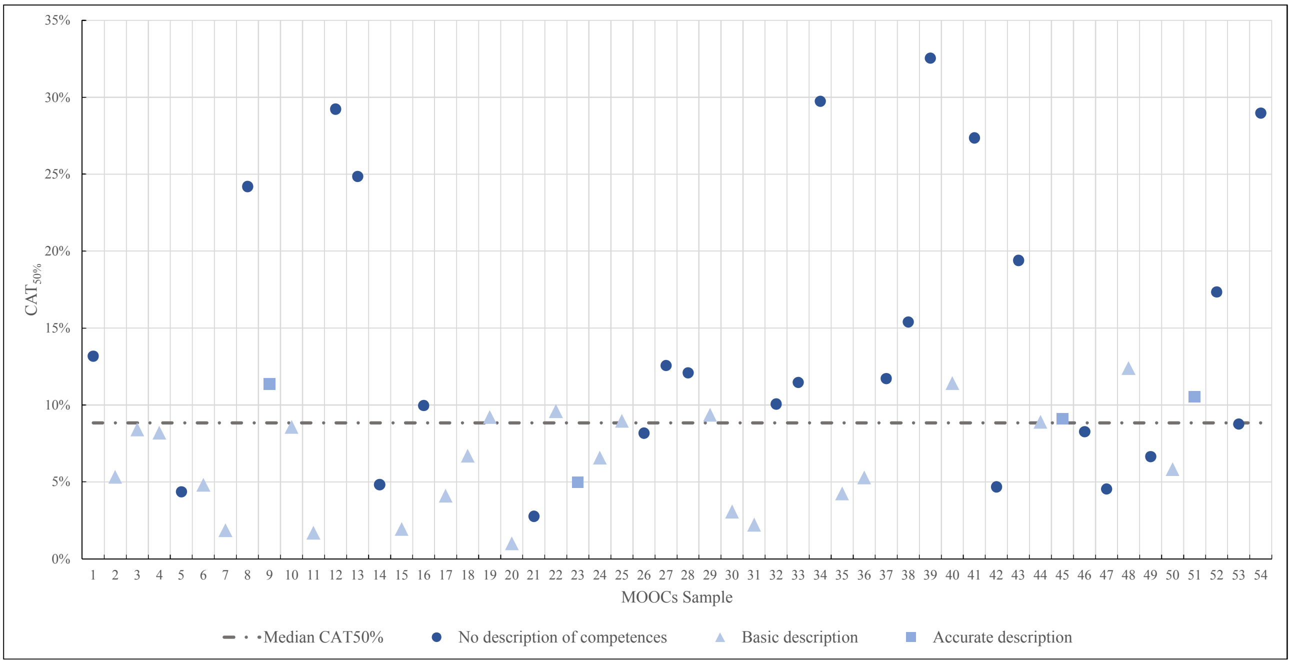
Legend:

(0) No description of competences that students will gain when they complete the MOOC.
(1) A simple description of competences is described and available to students.
(2) A more accurate description of competences is developed and available to students.

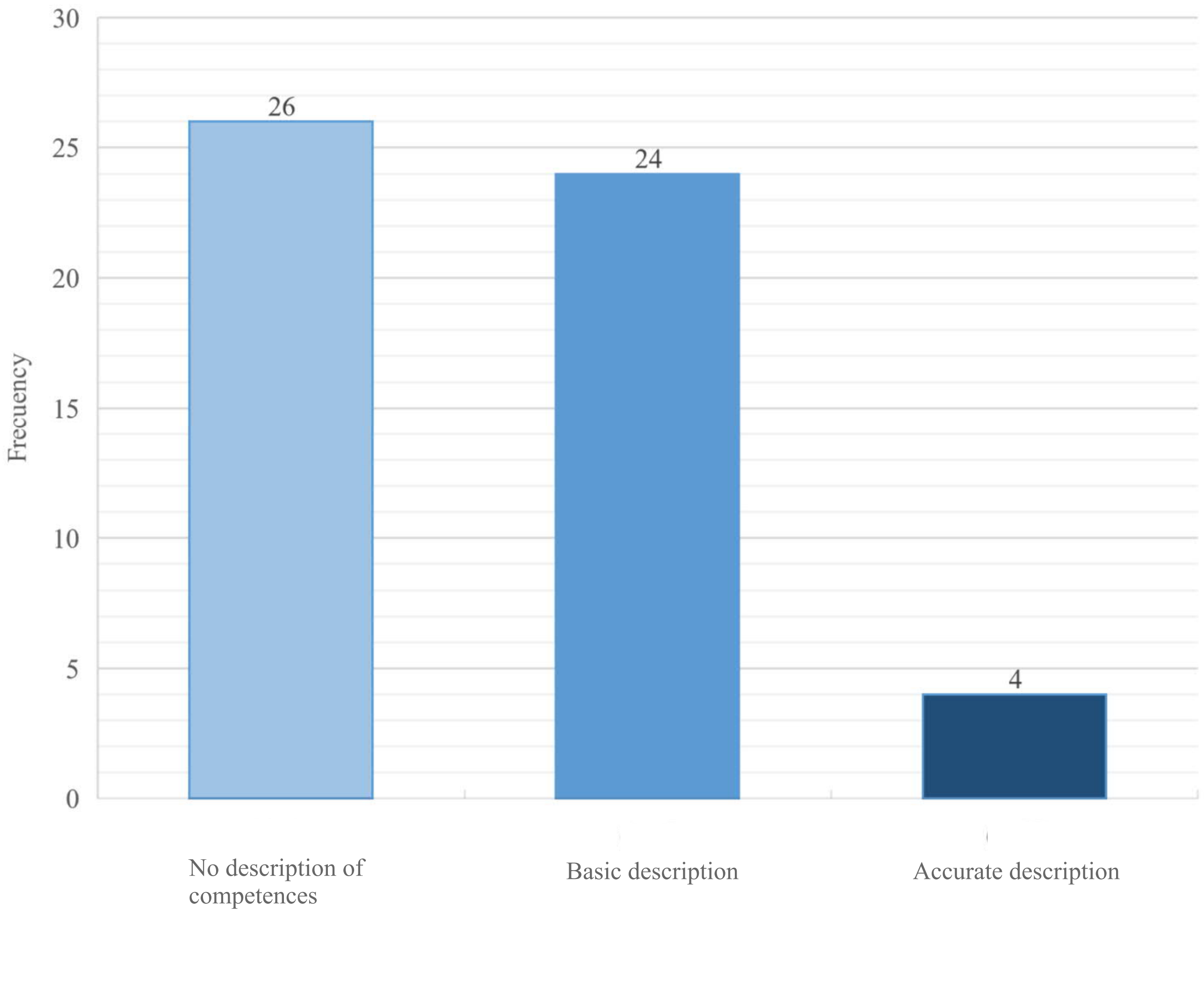
Nr.	CAT50%	What you will learn	
1	13.18%	No description of competences	0
2	5.34%	Basic description	1
3	8.42%	Basic description	1
4	8.19%	Basic description	1
5	4.37%	No description of competences	0
6	4.81%	Basic description	1
7	1.86%	Basic description	1
8	24.20%	No description of competences	0
9	11.35%	Accurate description	2
10	8.57%	Basic description	1
11	1.70%	Basic description	1
12	29.23%	No description of competences	0
13	24.86%	No description of competences	0
14	4.82%	No description of competences	0
15	1.94%	Basic description	1
16	9.97%	No description of competences	0
17	4.10%	Basic description	1
18	6.71%	Basic description	1
19	9.22%	Basic description	1
20	1.01%	Basic description	1

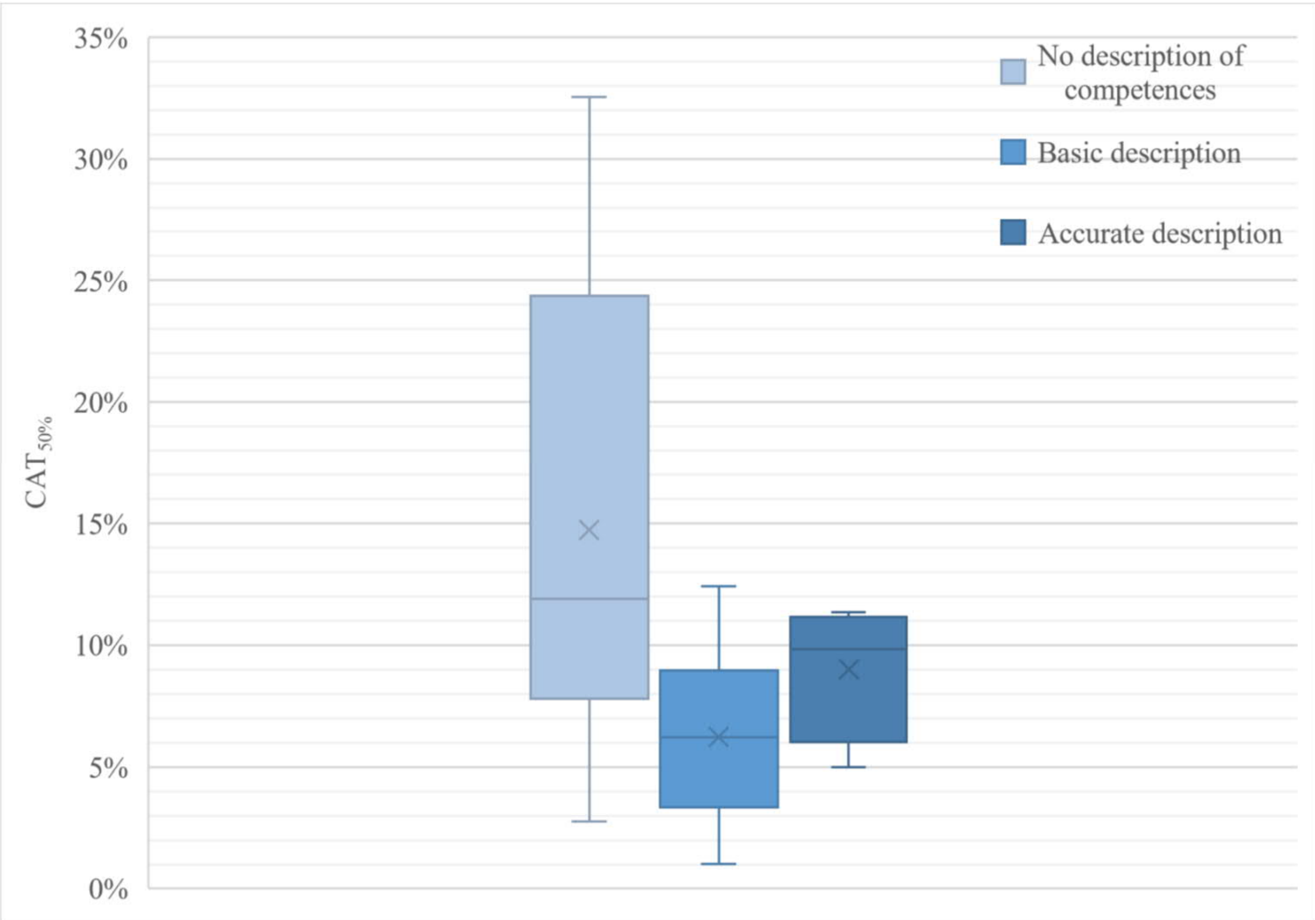
21	2.77%	No description of competences	0
22	9.60%	Basic description	1
23	4.99%	Accurate description	2
24	6.57%	Basic description	1
25	8.97%	Basic description	1
26	8.17%	No description of competences	0
27	12.57%	No description of competences	0
28	12.10%	No description of competences	0
29	9.37%	Basic description	1
30	3.08%	Basic description	1
31	2.22%	Basic description	1
32	10.06%	No description of competences	0
33	11.47%	No description of competences	0
34	29.75%	No description of competences	0
35	4.25%	Basic description	1
36	5.29%	Basic description	1
37	11.73%	No description of competences	0
38	15.40%	No description of competences	0
39	32.54%	No description of competences	0
40	11.42%	Basic description	1
41	27.37%	No description of competences	0
42	4.68%	No description of competences	0
43	19.41%	No description of competences	0
44	8.92%	Basic description	1

45	9.11%	Accurate description	2
46	8.27%	No description of competences	0
47	4.54%	No description of competences	0
48	12.41%	Basic description	1
49	6.65%	No description of competences	0
50	5.83%	Basic description	1
51	10.55%	Accurate description	2
52	17.35%	No description of competences	0
53	8.76%	No description of competences	0
54	28.98%	No description of competences	0



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
No description of competences
Basic description
Accurate description


30
25
20
15
10
5
0
Frecuency
26
24
4
No description of competences
Basic description
Accurate description



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
No description of competences
Basic description
Accurate description

Appendix 8. Skills you will gain

Legend:

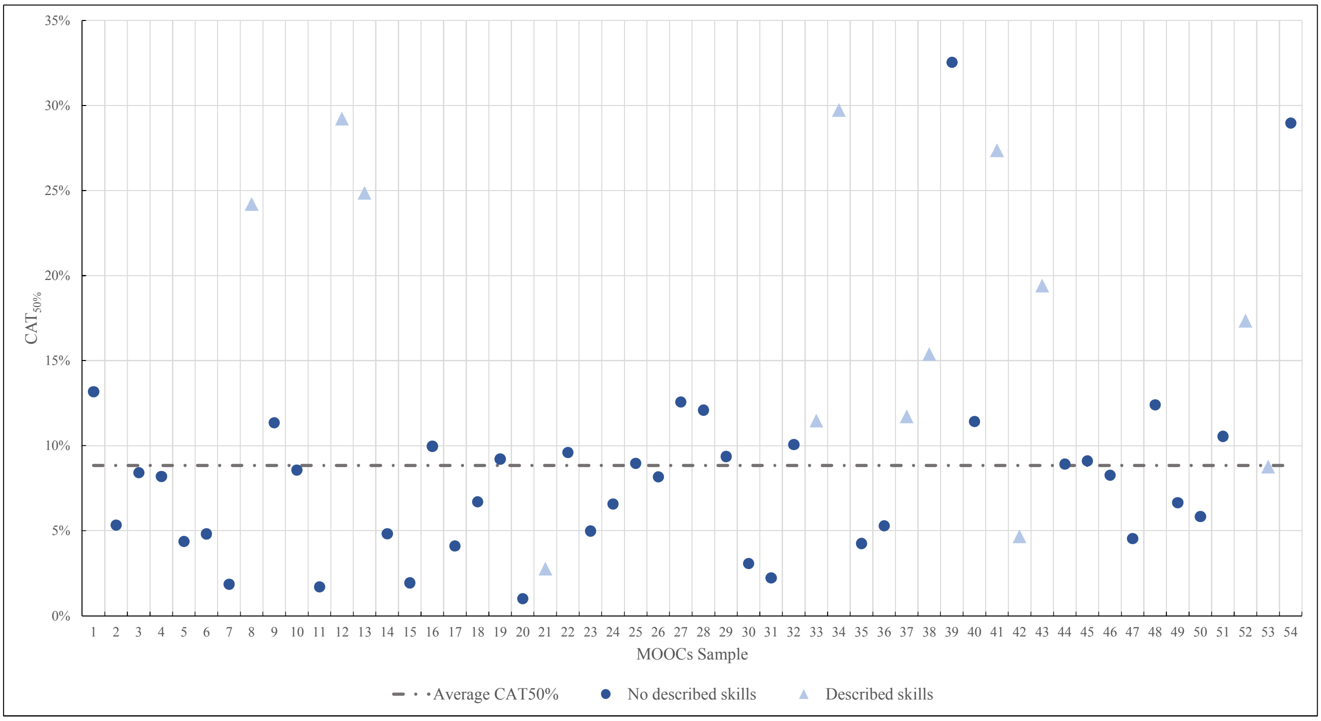
(0) MOOCs in which one cannot find described skills that students will gain during the course.

(1) MOOCs in which the skills students will attain once they finish the learning process successfully are described.

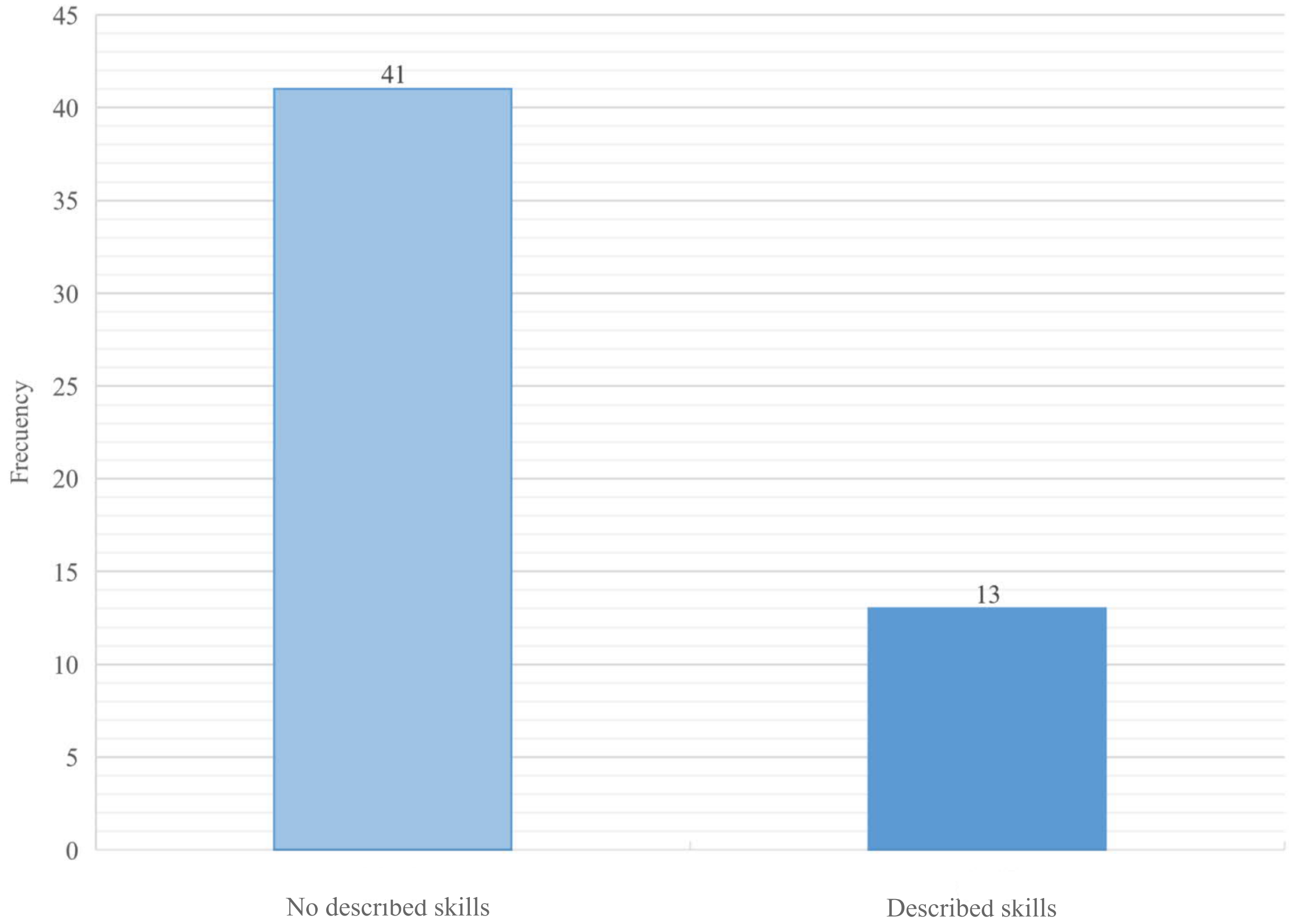
Nr.	CAT50%	Skills you will gain	
1	13.18%	No described skills	0
2	5.34%	No described skills	0
3	8.42%	No described skills	0
4	8.19%	No described skills	0
5	4.37%	No described skills	0
6	4.81%	No described skills	0
7	1.86%	No described skills	0
8	24.20%	Described skills	1
9	11.35%	No described skills	0
10	8.57%	No described skills	0
11	1.70%	No described skills	0
12	29.23%	Described skills	1
13	24.86%	Described skills	1
14	4.82%	No described skills	0
15	1.94%	No described skills	0
16	9.97%	No described skills	0
17	4.10%	No described skills	0
18	6.71%	No described skills	0

19	9.22%	No described skills	0
20	1.01%	No described skills	0
21	2.77%	Described skills	1
22	9.60%	No described skills	0
23	4.99%	No described skills	0
24	6.57%	No described skills	0
25	8.97%	No described skills	0
26	8.17%	No described skills	0
27	12.57%	No described skills	0
28	12.10%	No described skills	0
29	9.37%	No described skills	0
30	3.08%	No described skills	0
31	2.22%	No described skills	0
32	10.06%	No described skills	0
33	11.47%	Described skills	1
34	29.75%	Described skills	1
35	4.25%	No described skills	0
36	5.29%	No described skills	0
37	11.73%	Described skills	1
38	15.40%	Described skills	1
39	32.54%	No described skills	0
40	11.42%	No described skills	0
41	27.37%	Described skills	1
42	4.68%	Described skills	1

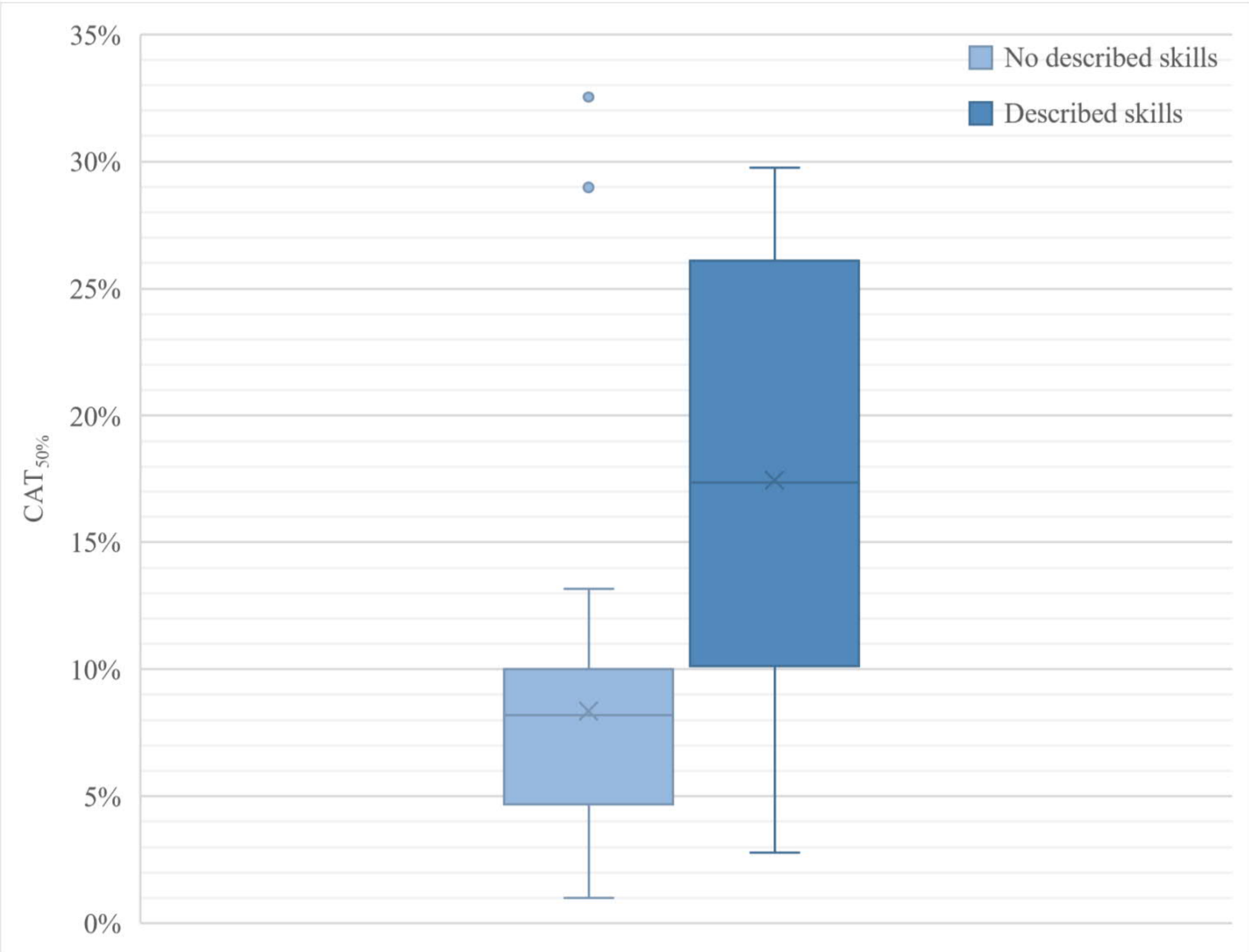
43	19.41%	Described skills	1
44	8.92%	No described skills	0
45	9.11%	No described skills	0
46	8.27%	No described skills	0
47	4.54%	No described skills	0
48	12.41%	No described skills	0
49	6.65%	No described skills	0
50	5.83%	No described skills	0
51	10.55%	No described skills	0
52	17.35%	Described skills	1
53	8.76%	Described skills	1
54	28.98%	No described skills	0



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Average CAT50%
No described skills
Described skills



45
40
35
30
25
20
15
10
5
0
Frecuency
41
13
No described skills
Described skills



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
No described skills
Described skills

Appendix 9. Level of the course

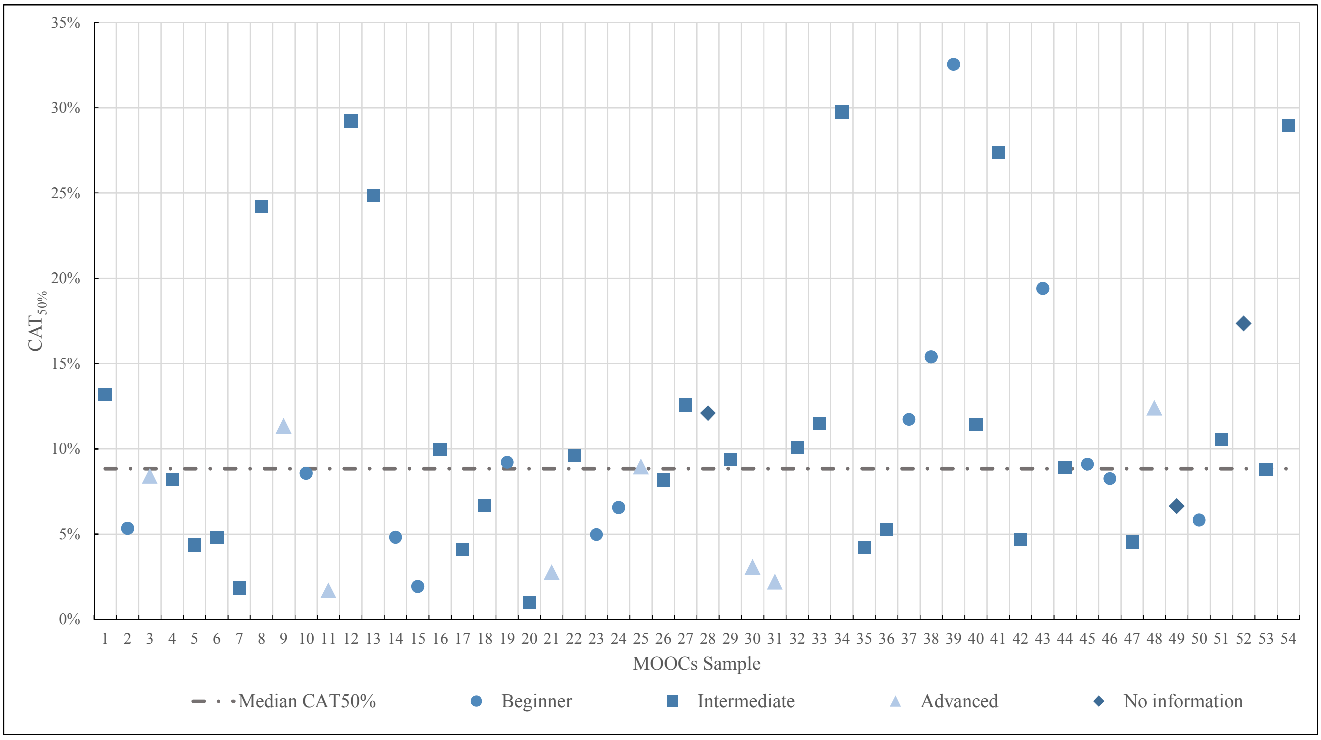
Legend:

(0) MOOC aimed at beginners.
(1) MOOC aimed at intermediate students.
(2) MOOC aimed at advanced students.
(3) There is no information related to entry level.

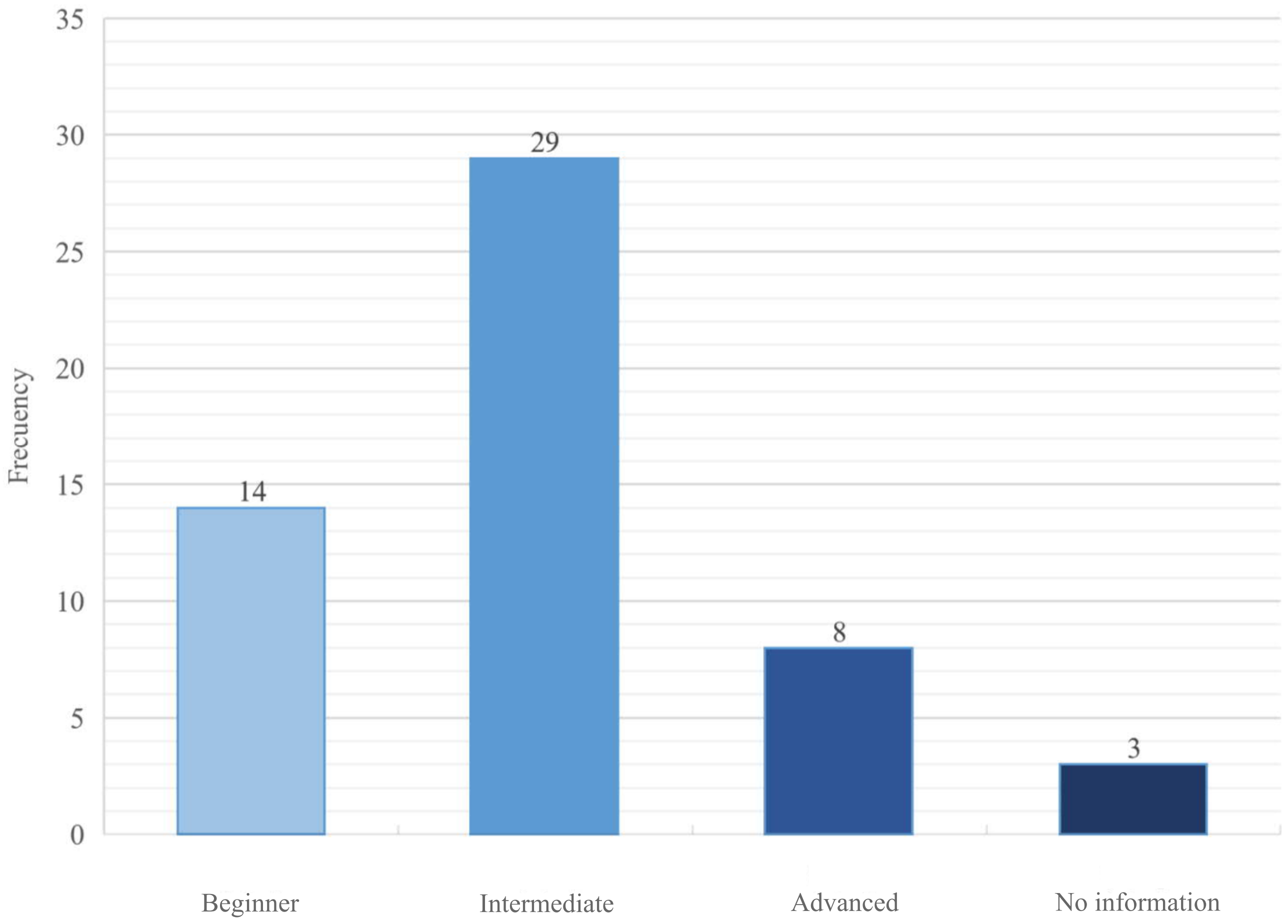
Nr.	CAT50%	Level of the course	
1	13.18%	Intermediate	1
2	5.34%	Beginner	0
3	8.42%	Advanced	2
4	8.19%	Intermediate	1
5	4.37%	Intermediate	1
6	4.81%	Intermediate	1
7	1.86%	Intermediate	1
8	24.20%	Intermediate	1
9	11.35%	Advanced	2
10	8.57%	Beginner	0
11	1.70%	Advanced	2
12	29.23%	Intermediate	1
13	24.86%	Intermediate	1
14	4.82%	Beginner	0
15	1.94%	Beginner	0
16	9.97%	Intermediate	1
17	4.10%	Intermediate	1
18	6.71%	Intermediate	1

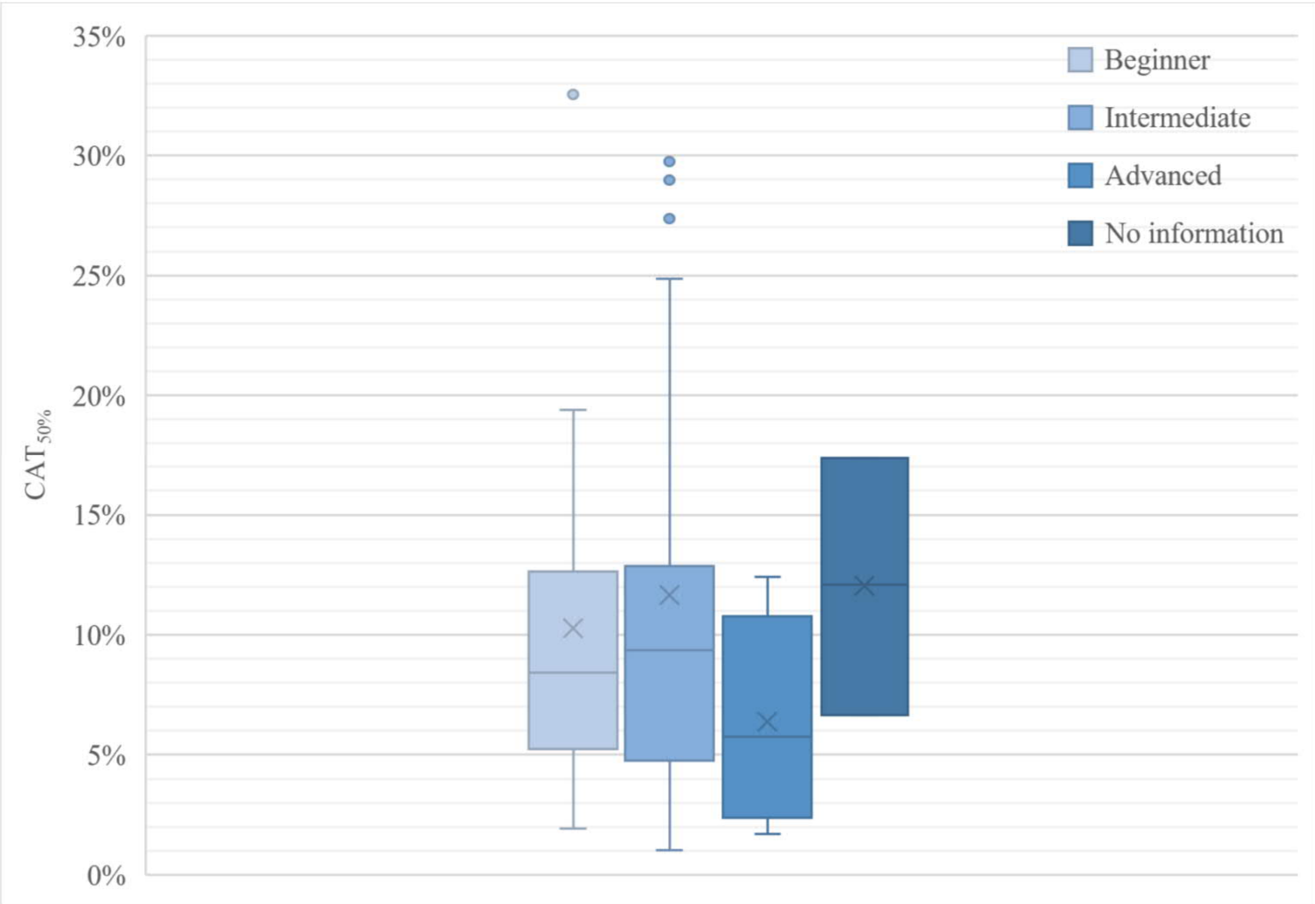
19	9.22%	Beginner	0
20	1.01%	Intermediate	1
21	2.77%	Advanced	2
22	9.60%	Intermediate	1
23	4.99%	Beginner	0
24	6.57%	Beginner	0
25	8.97%	Advanced	2
26	8.17%	Intermediate	1
27	12.57%	Intermediate	1
28	12.10%	No information	3
29	9.37%	Intermediate	1
30	3.08%	Advanced	2
31	2.22%	Advanced	2
32	10.06%	Intermediate	1
33	11.47%	Intermediate	1
34	29.75%	Intermediate	1
35	4.25%	Intermediate	1
36	5.29%	Intermediate	1
37	11.73%	Beginner	0
38	15.40%	Beginner	0
39	32.54%	Beginner	0
40	11.42%	Intermediate	1
41	27.37%	Intermediate	1
42	4.68%	Intermediate	1

43	19.41%	Beginner	0
44	8.92%	Intermediate	1
45	9.11%	Beginner	0
46	8.27%	Beginner	0
47	4.54%	Intermediate	1
48	12.41%	Advanced	2
49	6.65%	No information	3
50	5.83%	Beginner	0
51	10.55%	Intermediate	1
52	17.35%	No information	3
53	8.76%	Intermediate	1
54	28.98%	Intermediate	1



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Beginner
Intermediate
Advanced
No information


35
30
25
20
15
10
5
0
Frecuency
14
29
8
3
Beginner
Intermediate
Advanced
No information



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
Beginner
Intermediate
Advanced
No information

Appendix 10. Course length

Legend:

(0) intervals up to 30 h

(1) intervals between 30 h and 40 h

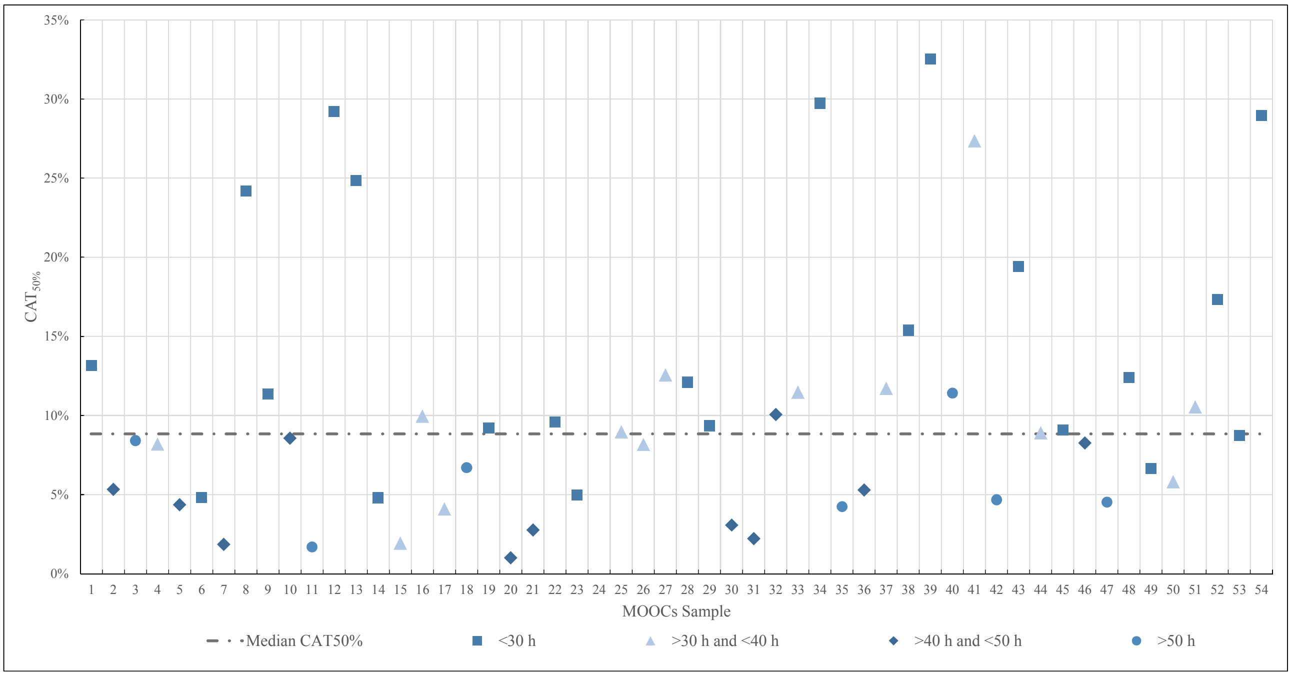
(2) intervals between 40 h and 50 h

(3) intervals more than 50 h

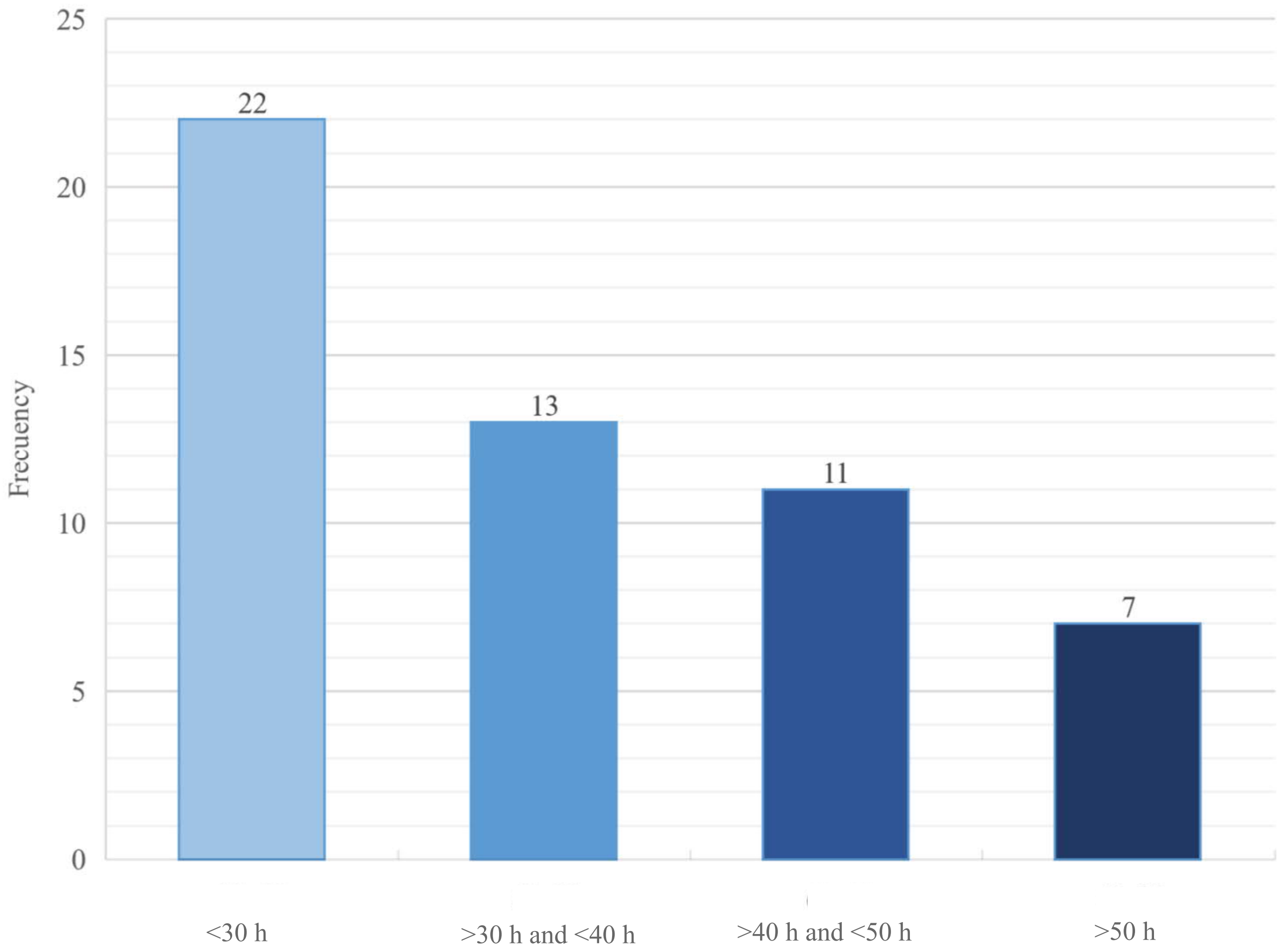
Nr.	CAT50%	Course length	
1	13.18%	25 h / 12 weeks / 5-6h per week	0
2	5.34%	42 h/ 7 weeks	2
3	8.42%	56 h/ 7 weeks	3
4	8.19%	35 h /8 weeks	1
5	4.37%	40 h / 7 weeks /4-6h per week	2
6	4.81%	3-4h per week / 24 h /6 weeks	0
7	1.86%	5-6h per week / 42h / 7 weeks	2
8	24.20%	6h per week / 15h / 4 weeks	0
9	11.35%	2-4h per week / 28h/ 7 weeks	0
10	8.57%	42 h / 8 weeks	2
11	1.70%	8 weeks / 6-8h per week/ 64h	3
12	29.23%	13 h to complete / 6 weeks	0
13	24.86%	23 h to complete /6 weeks	0
14	4.82%	20 h to complete / 6 weeks	0
15	1.94%	10 weeks / 3-4 H week	1
16	9.97%	34 h to compelete / 4 weeks / 4-5h per week	1
17	4.10%	10 weeks / 2-3h week	1
18	6.71%	8 weeks / 5-7h per week	3
19	9.22%	6 weeks / 2-3h/week	0

20	1.01%	7 weeks / 5-6h per week	2
21	2.77%	49 h / 5 weeks/ 6h per week	2
22	9.60%	7 weeks / 2-3h per week	0
23	4.99%	6 weeks / 3-4h per week	0
24	6.57%	4 weeks / ? h per week/ no information	
25	8.97%	7 weeks / 3-5h per week	1
26	8.17%	37 h / 7 weeks / 4-7 h per week	1
27	12.57%	35 h / 8 weeks / 4h per week	1
28	12.10%	30 h / 7 weeks / 4-5h per week	0
29	9.37%	7 weeks / 3-4 h per week	0
30	3.08%	6 weeks / 5-8 h/week	2
31	2.22%	7 weeks / 5-7 h per week	2
32	10.06%	41 h / 7 weeks/ 4-6h per week	2
33	11.47%	32 h / 7 weeks / 4-6h per week	1
34	29.75%	16h to complete / 4 weeks / 6h per week	0
35	4.25%	10 weeks / 5-6h per week	3
36	5.29%	8 weeks / 5-6h per week	2
37	11.73%	33 h to complete / 8 weeks / 4-6h per week	1
38	15.40%	24 h to complete / 7 weeks / 4-6h per week	0
39	32.54%	12h / 5 weeks / 2-3h per week	0
40	11.42%	5-7 h/week / 9 weeks	3
41	27.37%	approx. 11 h to complete / 5 weeks / 4-6h per week	1
42	4.68%	approx. 31h to complete / 8 weeks / 8-10h per week	3
43	19.41%	approx. 12h to cmplete / 5 weeks / 2-3h per week	0

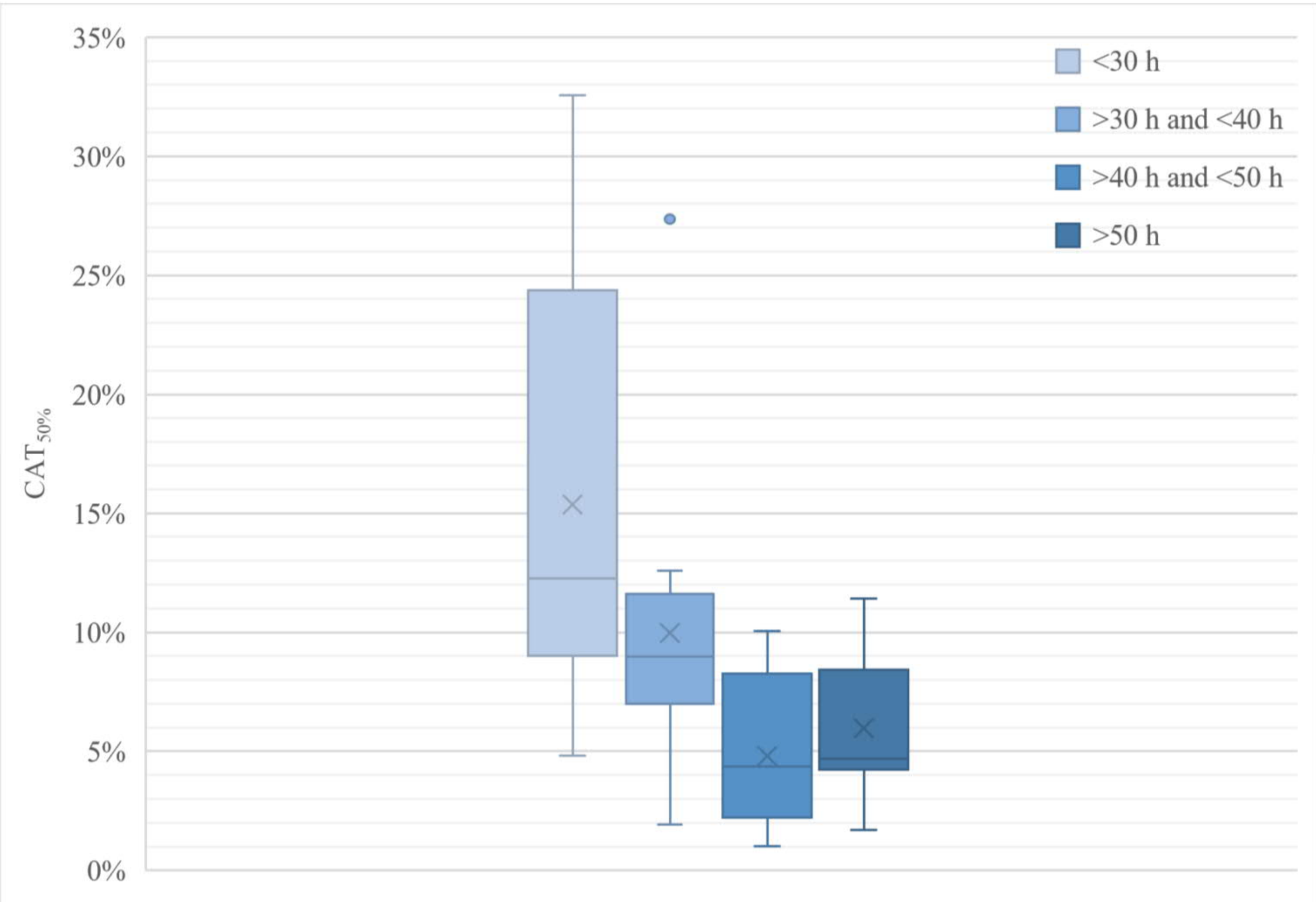
44	8.92%	approx. 2-4h per week / 8 weeks	1
45	9.11%	2 or 3h per week / 7 weeks	0
46	8.27%	47 h to complete / 10 weeks / 4-6h per week	2
47	4.54%	approx. 44h to complete / 11 weeks / 4-6h per week	3
48	12.41%	10 weeks / 2-3h per week	0
49	6.65%	approx. 19h to complete / 4 weeks /1-3 h per week	0
50	5.83%	6 weeks / 4-6h per week	1
51	10.55%	11 weeks / 2-3h per week	1
52	17.35%	approx. 13h to complete / 5 weeks / 1-3h per week	0
53	8.76%	approx. 14h to complete / 5 weeks / 4-6h per week	0
54	28.98%	approx. 11 h to complete / 5 weeks / 4-6h per week	0



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
<30 h
>30 h and <40 h
>40 h and <50 h
>50 h



25
20
15
10
5
0
Frecuency
22
13
11
7
<30 h
>30 h and <40 h
>40 h and <50 h
>50 h



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
<30 h
>30 h and <40 h
>40 h and <50 h
>50 h

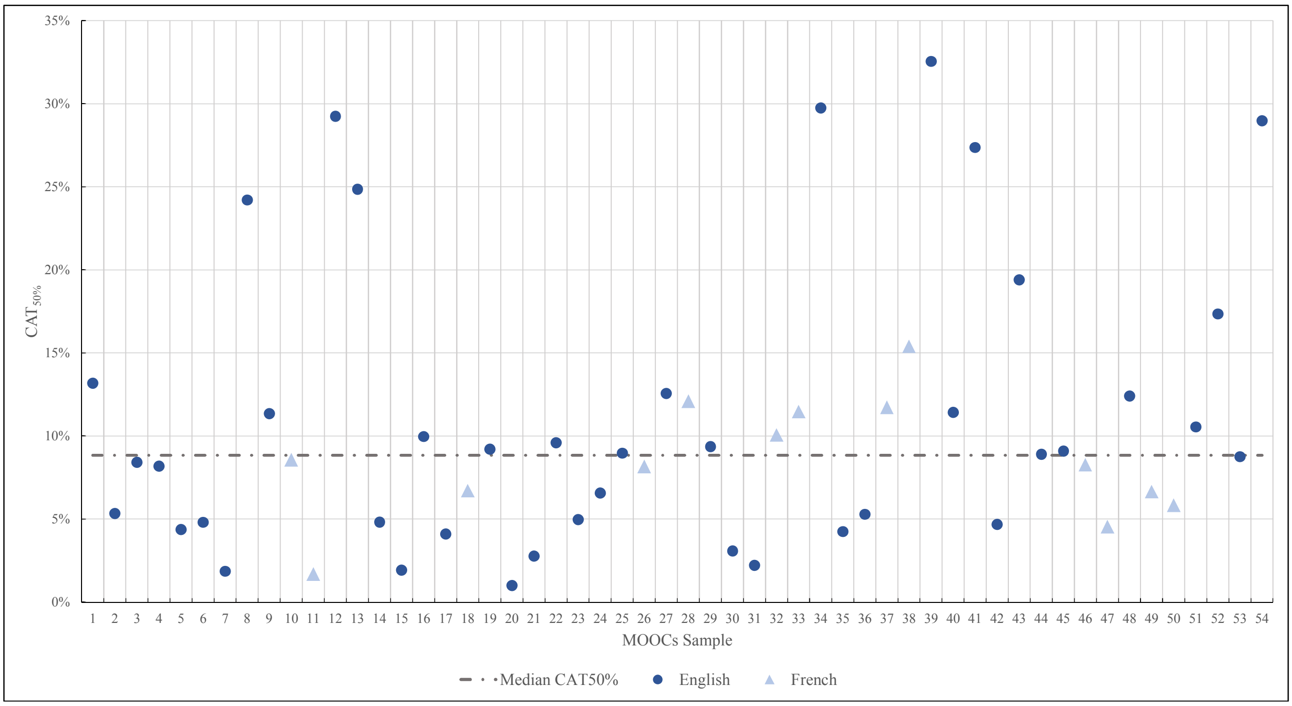
Appendix 11. Language

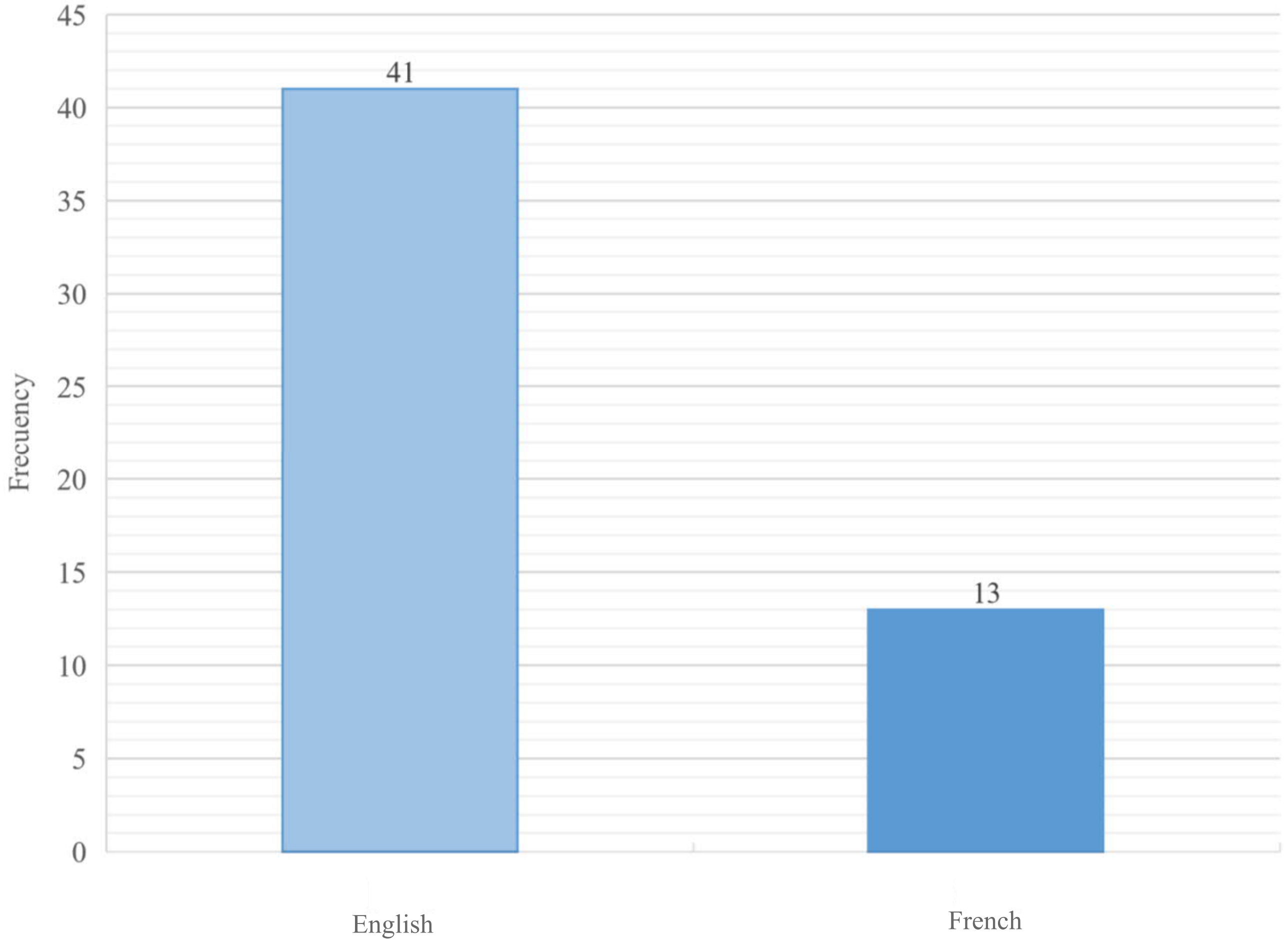
Legend:
(0) English.
(1) French, the local language.

Nr.	CAT50%	Language	
1	13.18%	English	0
2	5.34%	English	0
3	8.42%	English	0
4	8.19%	English	0
5	4.37%	French	0
6	4.81%	English	0
7	1.86%	English	0
8	24.20%	English	0
9	11.35%	English	0
10	8.57%	French	1
11	1.70%	French	1
12	29.23%	English	0
13	24.86%	English	0
14	4.82%	English	0
15	1.94%	English	0
16	9.97%	English	0
17	4.10%	English	0
18	6.71%	French	1
19	9.22%	English	0
20	1.01%	English	0

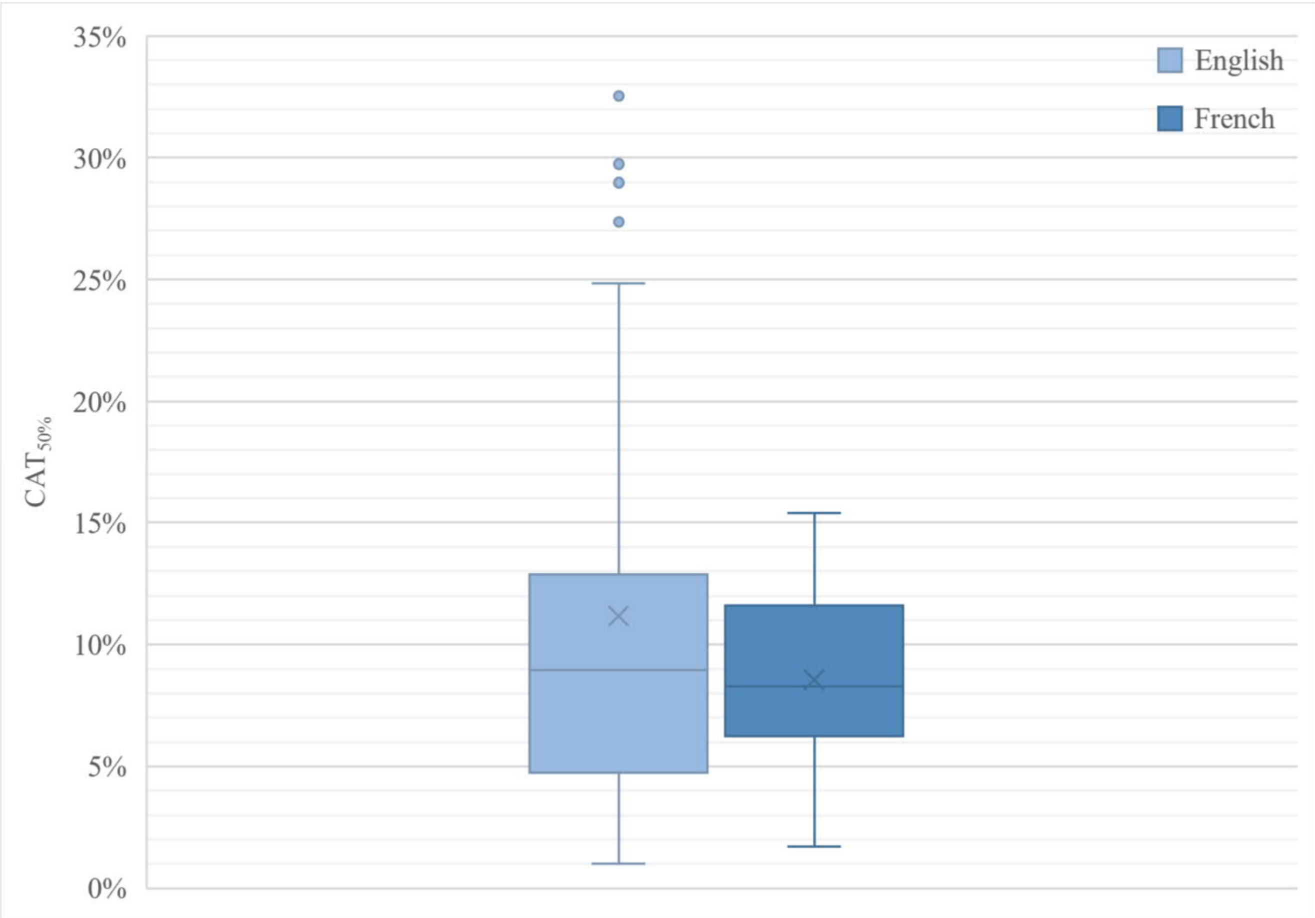
21	2.77%	English	0
22	9.60%	English	0
23	4.99%	English	0
24	6.57%	English	0
25	8.97%	English	0
26	8.17%	French	1
27	12.57%	English	0
28	12.10%	French	1
29	9.37%	English	0
30	3.08%	English	0
31	2.22%	English	0
32	10.06%	French	1
33	11.47%	French	1
34	29.75%	English	0
35	4.25%	English	0
36	5.29%	English	0
37	11.73%	French	1
38	15.40%	French	1
39	32.54%	English	0
40	11.42%	English	0
41	27.37%	English	0
42	4.68%	English	0
43	19.41%	English	0
44	8.92%	English	0

45	9.11%	English	0
46	8.27%	French	1
47	4.54%	French	1
48	12.41%	English	0
49	6.65%	French	1
50	5.83%	French	1
51	10.55%	English	0
52	17.35%	English	0
53	8.76%	English	0
54	28.98%	English	0


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
English
French



45
40
35
30
25
20
15
10
5
0
Frecuency
41
13
English
French


35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
English
French

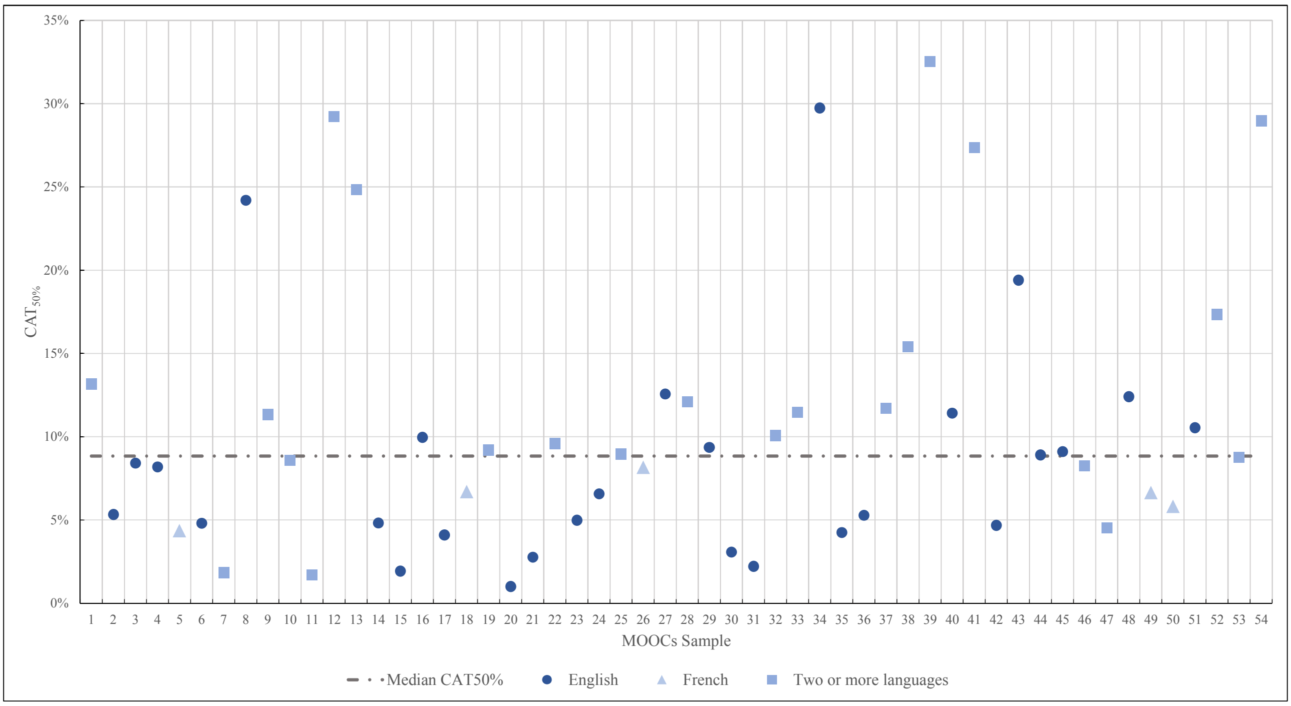
Appendix 12. Transcriptions of videos

Legend:
(0) There is only transcriptions in English.
(1) There are only transcriptions in French, the local language.
(2) There are transcriptions in two or more languages.

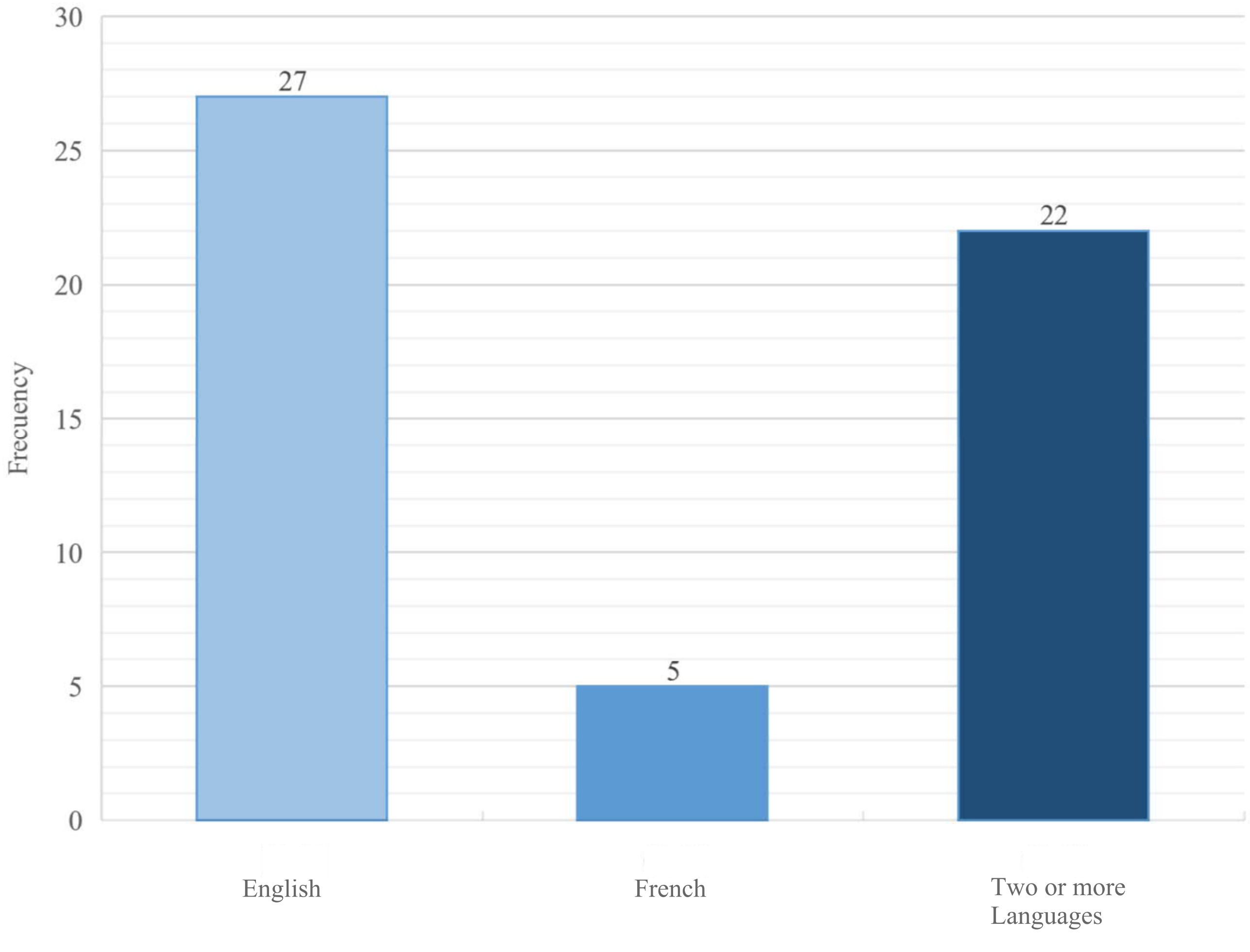
Nr.	CAT50%	Transcriptions of videos	
1	13.18%	English, French, Portuguese	2
2	5.34%	English	0
3	8.42%	English	0
4	8.19%	English	0
5	4.37%	French	1
6	4.81%	English	0
7	1.86%	English, French	2
8	24.20%	English	0
9	11.35%	English, French	2
10	8.57%	English, French	2
11	1.70%	English, French	2
12	29.23%	English, French	2
13	24.86%	English, Korean, Serbian, French	2
14	4.82%	English	0
15	1.94%	English	0
16	9.97%	English	0
17	4.10%	English	0
18	6.71%	French	1
19	9.22%	English, French	2
20	1.01%	English	0

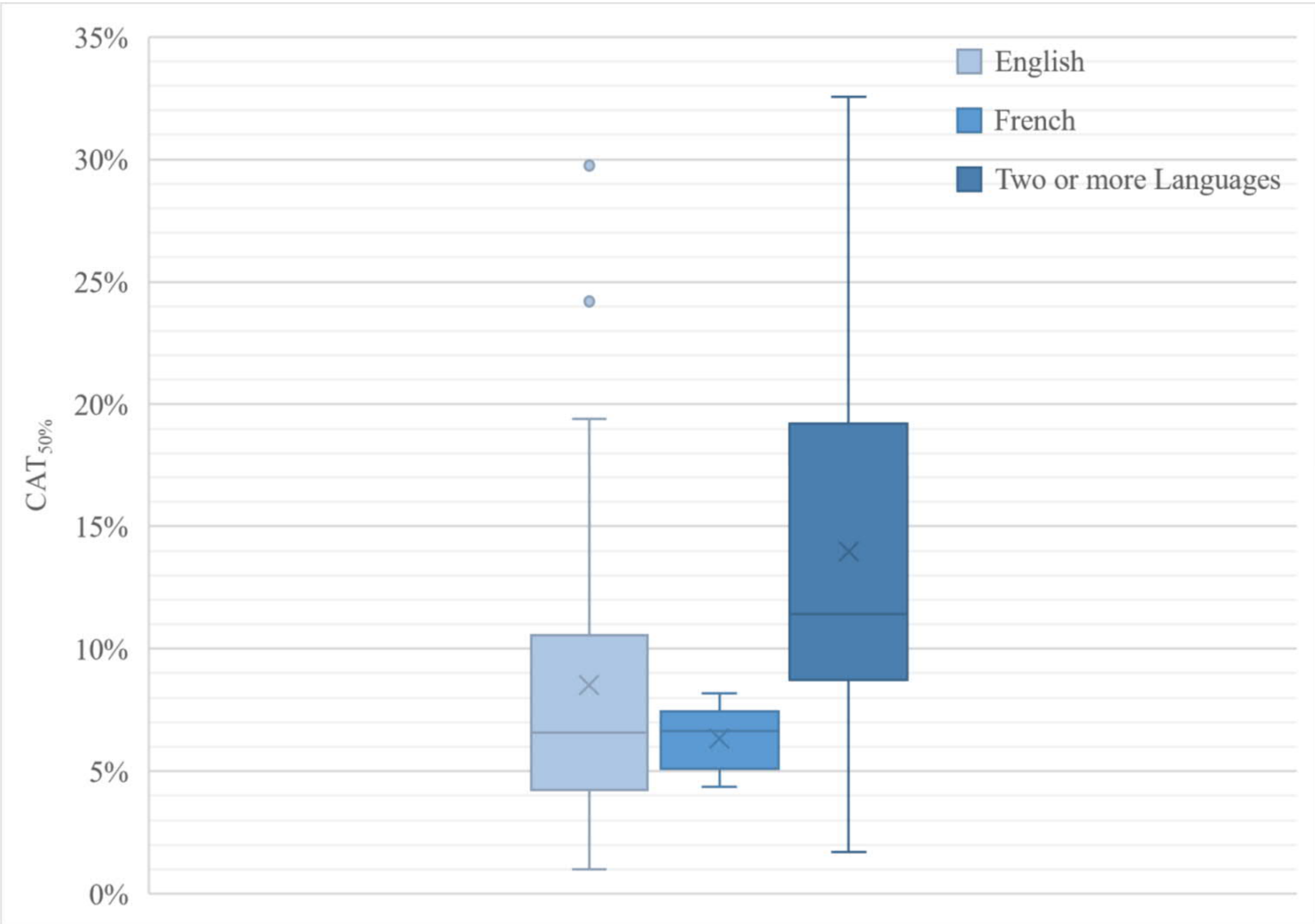
21	2.77%	English	0
22	9.60%	English, French	2
23	4.99%	English	0
24	6.57%	English	0
25	8.97%	English, French	2
26	8.17%	French	1
27	12.57%	English	0
28	12.10%	English, French	2
29	9.37%	English	0
30	3.08%	English	0
31	2.22%	English	0
32	10.06%	French, English	2
33	11.47%	French, English	2
34	29.75%	English	0
35	4.25%	English	0
36	5.29%	English	0
37	11.73%	French, English	2
38	15.40%	French, English	2
39	32.54%	English, French, Arabic, Spanish	2
40	11.42%	English	0
41	27.37%	French, Portuguese, (European), Russian, English, Spanish, Hindi	2
42	4.68%	English	0
43	19.41%	English	0
44	8.92%	English	0

45	9.11%	English	0
46	8.27%	French, English	2
47	4.54%	French, English	2
48	12.41%	English	0
49	6.65%	French	1
50	5.83%	French	1
51	10.55%	English	0
52	17.35%	English, French, Persian	2
53	8.76%	English, Spanish, French, Portuguese (European)	2
54	28.98%	English, Spanish, French, Portuguese (European)	2



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
English
French
Two or more languages


30
25
20
15
10
5
0
Frecuency
27
5
22
English
French
Two or more
Languages



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
English
French
Two or more Languages

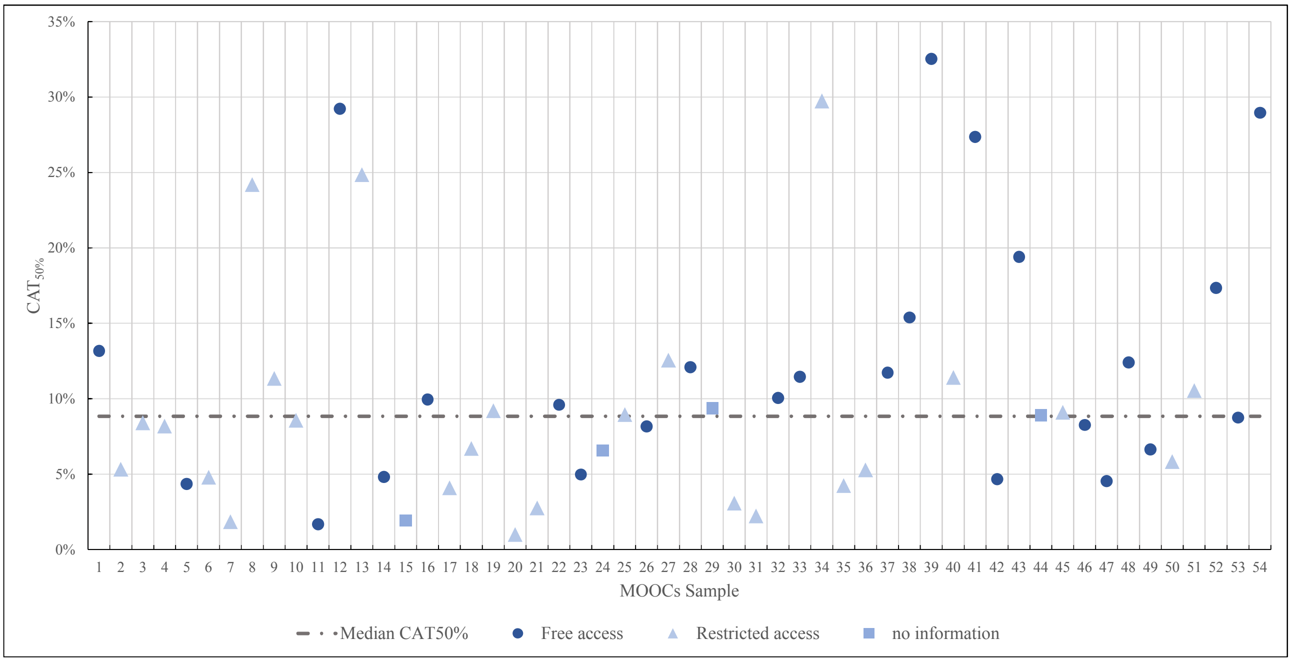
Appendix 13. Free access

Legend:
(0) Free to unlimited course access
(1) Free access, but no access to some of the upgraded quizzes or the final exam
(2) No info

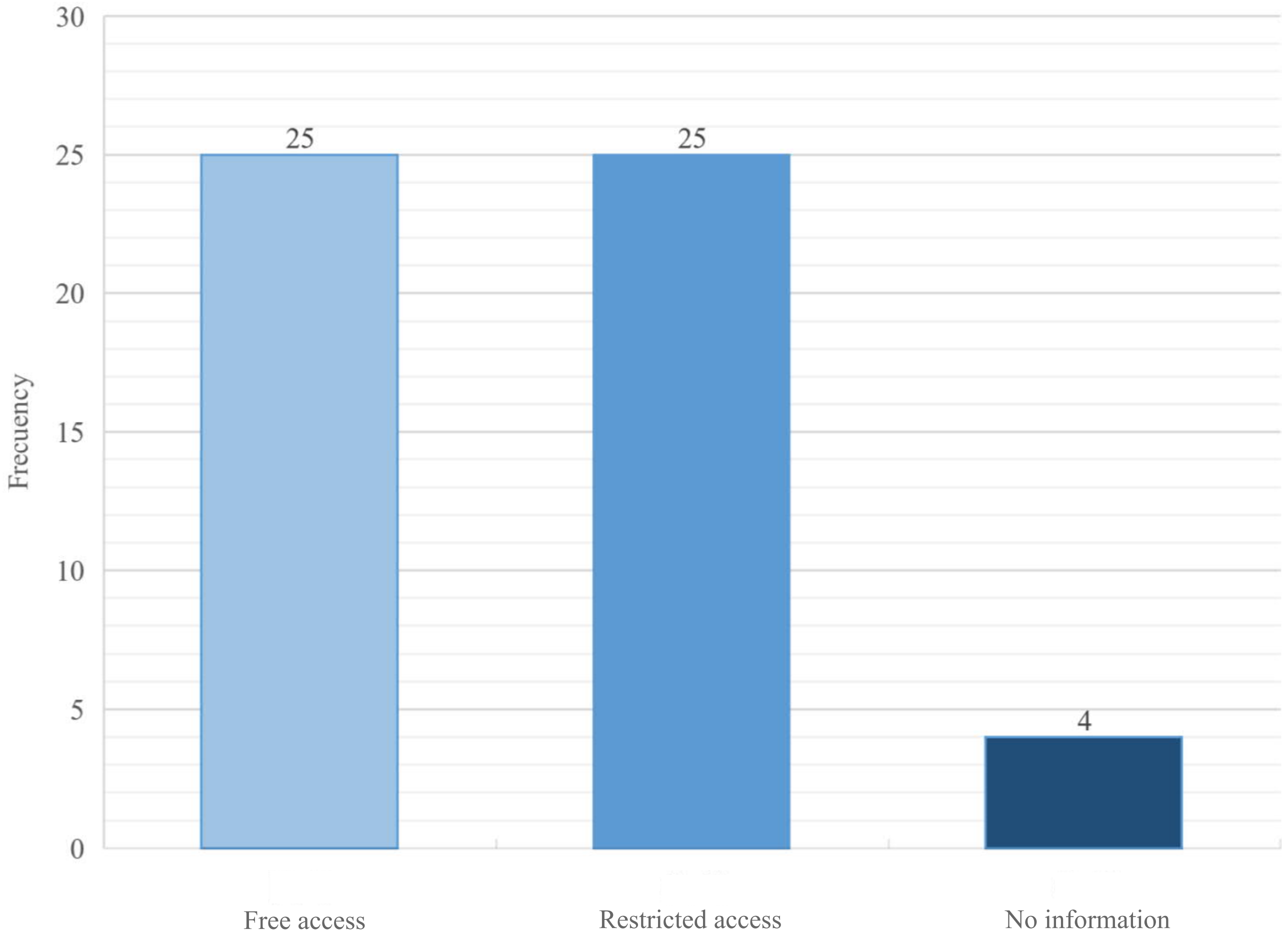
Nr.	CAT50%	Free access	
1	13.18%	Free access	0
2	5.34%	Restricted access	1
3	8.42%	Restricted access	1
4	8.19%	Restricted access	1
5	4.37%	Free access	0
6	4.81%	Restricted access	1
7	1.86%	Restricted access	1
8	24.20%	Restricted access	1
9	11.35%	Restricted access	1
10	8.57%	Restricted access	1
11	1.70%	Free access	0
12	29.23%	Free access	0
13	24.86%	Restricted access	1
14	4.82%	Free access	0
15	1.94%	no information	2
16	9.97%	Free access	0
17	4.10%	Restricted access	1
18	6.71%	Restricted access	1
19	9.22%	Restricted access	1
20	1.01%	Restricted access	1

21	2.77%	Restricted access	1
22	9.60%	Free access	0
23	4.99%	Free access	0
24	6.57%	no information	2
25	8.97%	Restricted access	1
26	8.17%	Free access	0
27	12.57%	Restricted access	1
28	12.10%	Free access	0
29	9.37%	no information	2
30	3.08%	Restricted access	1
31	2.22%	Restricted access	1
32	10.06%	Free access	0
33	11.47%	Free access	0
34	29.75%	Restricted access	1
35	4.25%	Restricted access	1
36	5.29%	Restricted access	1
37	11.73%	Free access	0
38	15.40%	Free access	0
39	32.54%	Free access	0
40	11.42%	Restricted access	1
41	27.37%	Free access	0
42	4.68%	Free access	0
43	19.41%	Free access	0
44	8.92%	no information	2

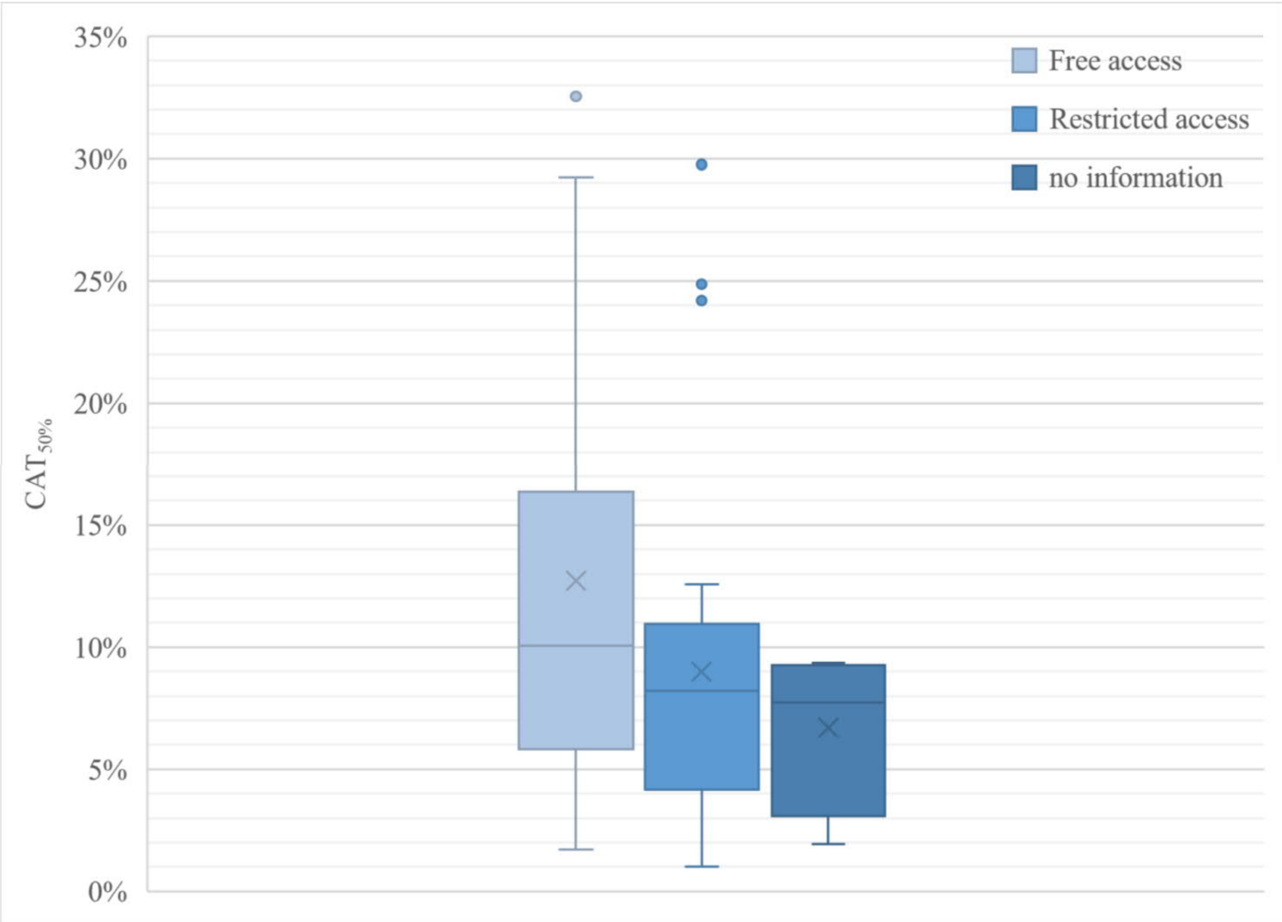
45	9.11%	Restricted access	1
46	8.27%	Free access	0
47	4.54%	Free access	0
48	12.41%	Free access	0
49	6.65%	Free access	0
50	5.83%	Restricted access	1
51	10.55%	Restricted access	1
52	17.35%	Free access	0
53	8.76%	Free access	0
54	28.98%	Free access	0



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Free access
Restricted access
no information



30
25
20
15
10
5
0
Frecuency
25
25
4
Free access
Restricted access
No information



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
Free access
Restricted access
no information

Appendix 14. Knowledge area

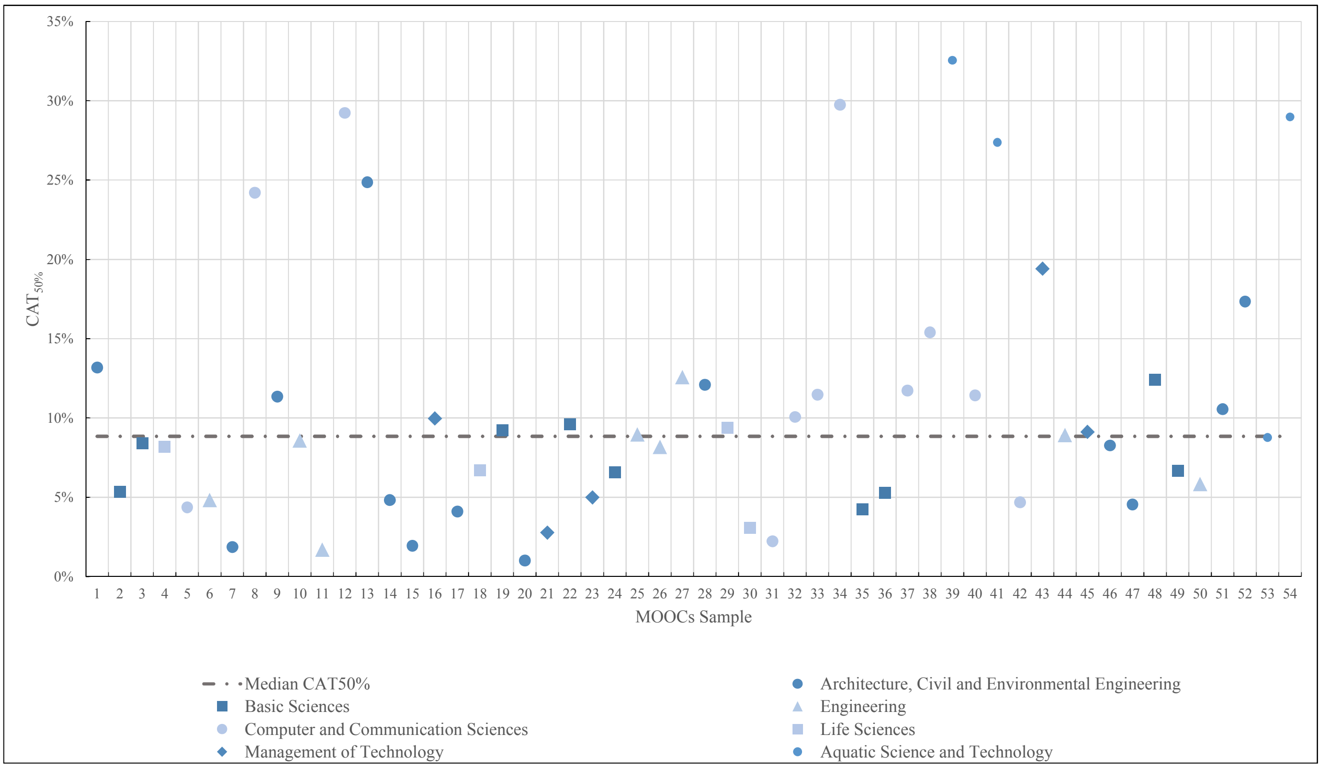
Legend:

(1) Architecture, Civil and Environmental Engineering
(2) Basic Sciences
(3) Engineering
(4) Computer and Communication Sciences
(5) Life Sciences
(6) Management of Technology
(7) Aquatic Science and Technology

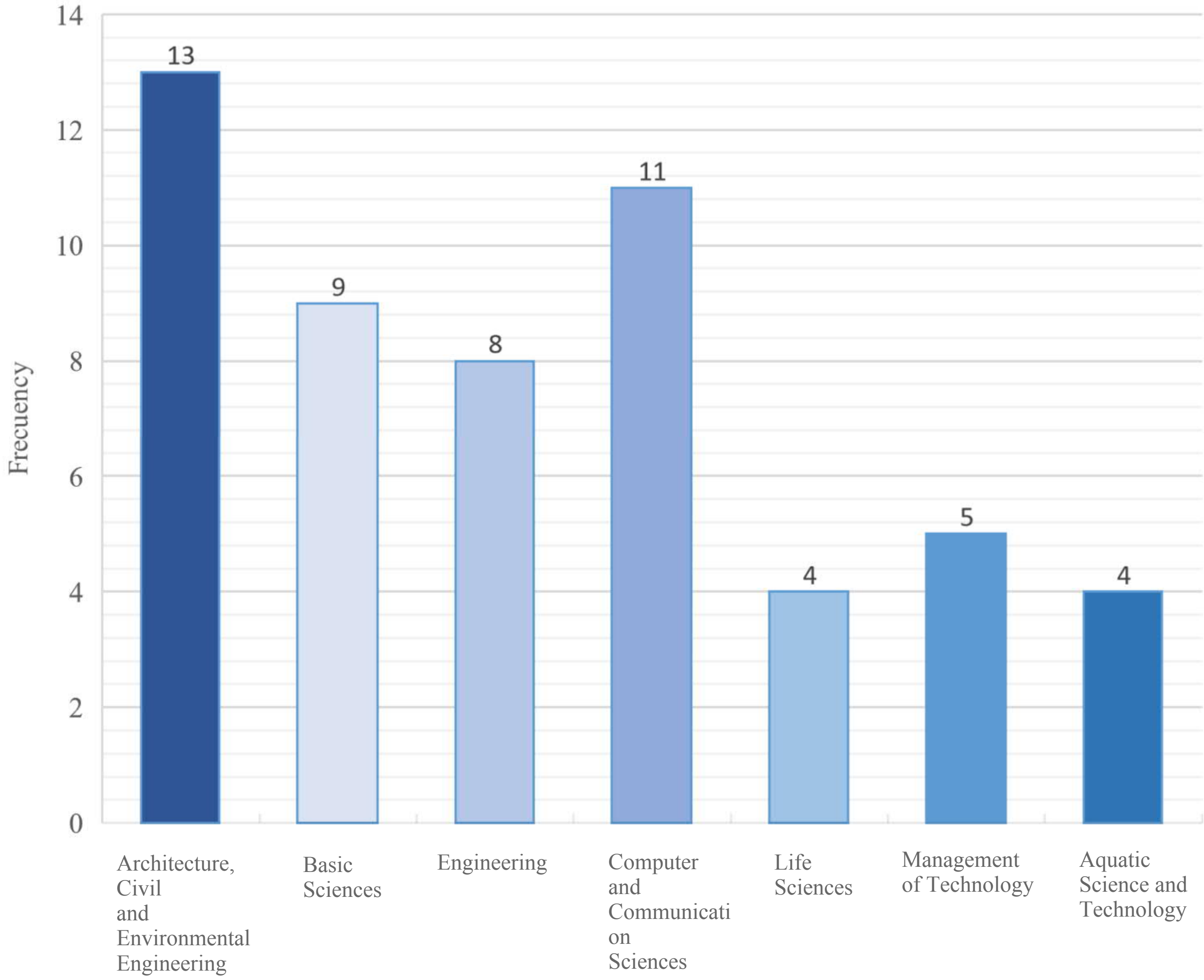
Nr.	CAT50%	Knowledge area	
1	13.18%	Architecture, Civil and Environmental Engineering	1
2	5.34%	Basic Sciences	2
3	8.42%	Basic Sciences	2
4	8.19%	Life Sciences	5
5	4.37%	Computer and Communication Sciences	4
6	4.81%	Engineering	3
7	1.86%	Architecture, Civil and Environmental Engineering	1
8	24.20%	Computer and Communication Sciences	4
9	11.35%	Architecture, Civil and Environmental Engineering	1
10	8.57%	Engineering	3
11	1.70%	Engineering	3
12	29.23%	Computer and Communication Sciences	4
13	24.86%	Computer and Communication Sciences	1
14	4.82%	Architecture, Civil and Environmental Engineering	1
15	1.94%	Architecture, Civil and Environmental Engineering	1
16	9.97%	Management of Technology	6
17	4.10%	Architecture, Civil and Environmental Engineering	1

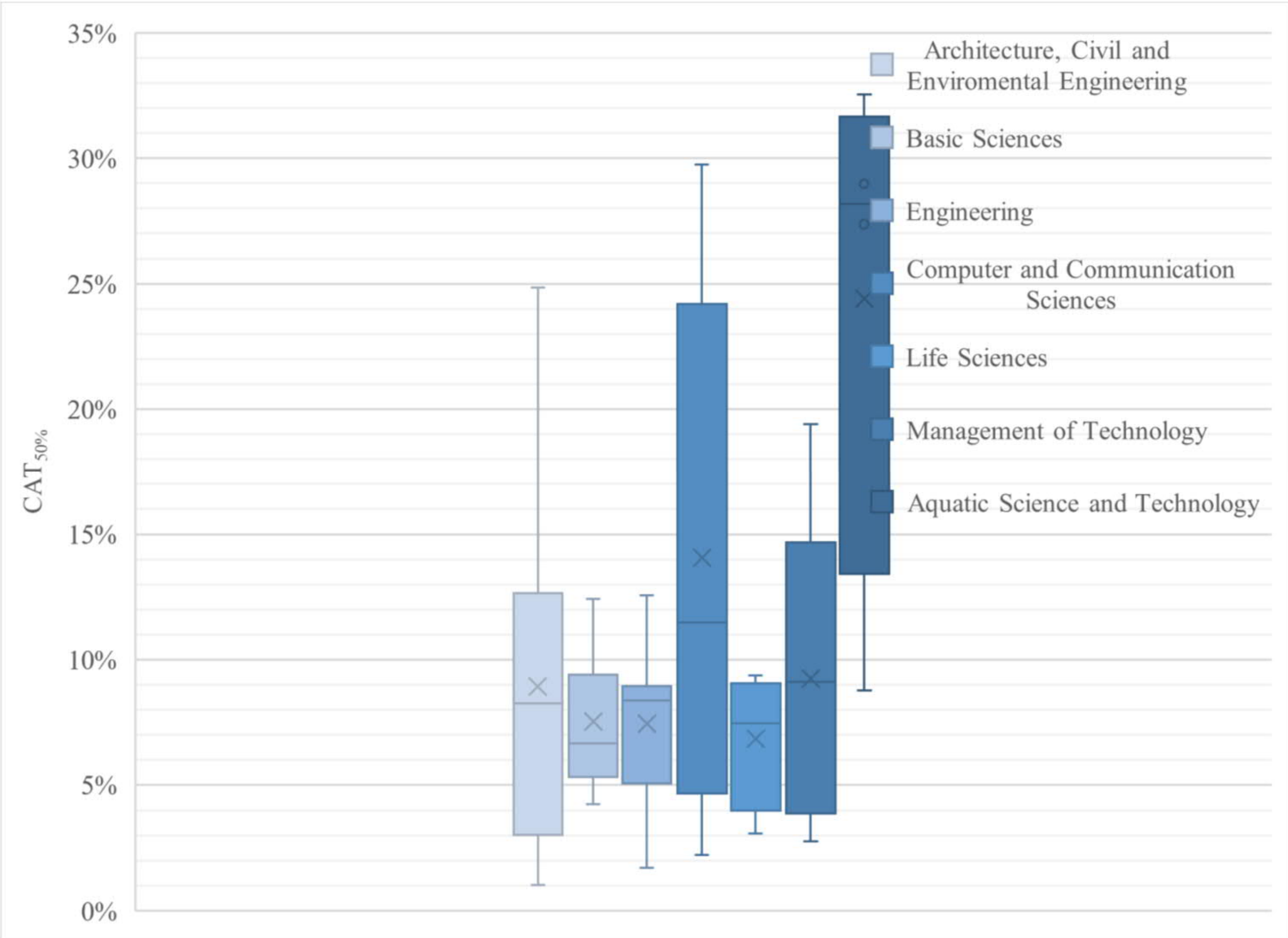
18	6.71%	Life Sciences	5
19	9.22%	Architecture, Civil and Environmental Engineering	2
20	1.01%	Architecture, Civil and Environmental Engineering	1
21	2.77%	Management of Technology	6
22	9.60%	Basic Sciences	2
23	4.99%	Management of Technology	6
24	6.57%	Basic Sciences	2
25	8.97%	Engineering	3
26	8.17%	Engineering	3
27	12.57%	Engineering	3
28	12.10%	Architecture, Civil and Environmental Engineering	1
29	9.37%	Life Sciences	5
30	3.08%	Life Sciences	5
31	2.22%	Computer and Communication Sciences	4
32	10.06%	Computer and Communication Sciences	4
33	11.47%	Computer and Communication Sciences	4
34	29.75%	Computer and Communication Sciences	4
35	4.25%	Basic Sciences	2
36	5.29%	Basic Sciences	2
37	11.73%	Computer and Communication Sciences	4
38	15.40%	Computer and Communication Sciences	4
39	32.54%	Aquatic Science and Technology	7
40	11.42%	Computer and Communication Sciences	4
41	27.37%	Aquatic Science and Technology	7

42	4.68%	Computer and Communication Sciences	4
43	19.41%	Management of Technology	6
44	8.92%	Engineering	3
45	9.11%	Management of Technology	6
46	8.27%	Architecture, Civil and Environmental Engineering	1
47	4.54%	Architecture, Civil and Environmental Engineering	1
48	12.41%	Basic Sciences	2
49	6.65%	Basic Sciences	2
50	5.83%	Engineering	3
51	10.55%	Architecture, Civil and Environmental Engineering	1
52	17.35%	Management of Technology	1
53	8.76%	Aquatic Science and Technology	7
54	28.98%	Aquatic Science and Technology	7



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Basic Sciences
Computer and Communication Sciences
Management of Technology
Architecture, Civil and Environmental Engineering
Engineering
Life Sciences
Aquatic Science and Technology


Frecuency
14
12
10
8
6
4
2
0
13
9
8
11
4
5
4
Architecture, Civil and Environmental Engineering
Basic Sciences
Engineering
Computer and Communication Sciences
Life Sciences
Management of Technology
Aquatic Science and Technology



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
Architecture, Civil and Enviromental Engineering
Basic Sciences
Engineering
Computer and Communication Sciences
Life Sciences
Management of Technology
Aquatic Science and Technology

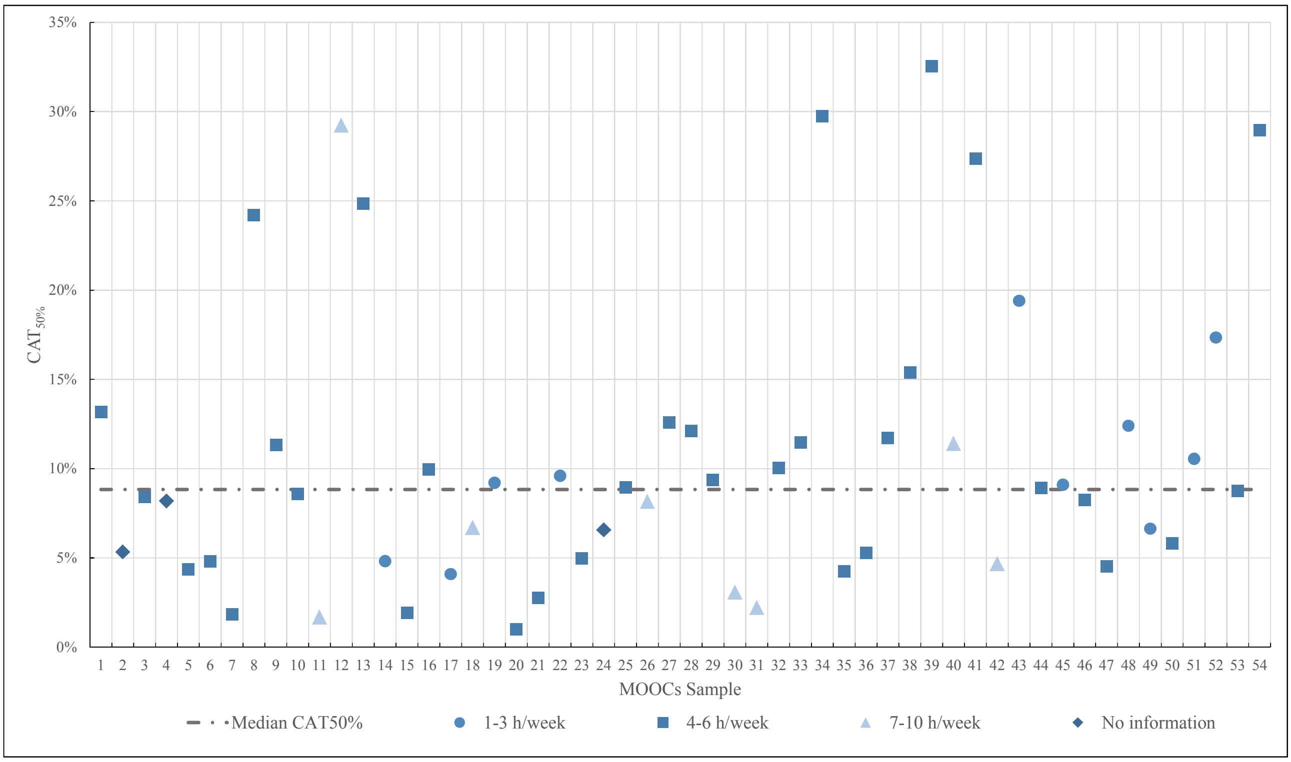
Appendix 15. Workload/week

Legend:
(0): 1-3 hours workload/week
(1): 4-6 hours workload/week
(2): 7-10 hours workload/week

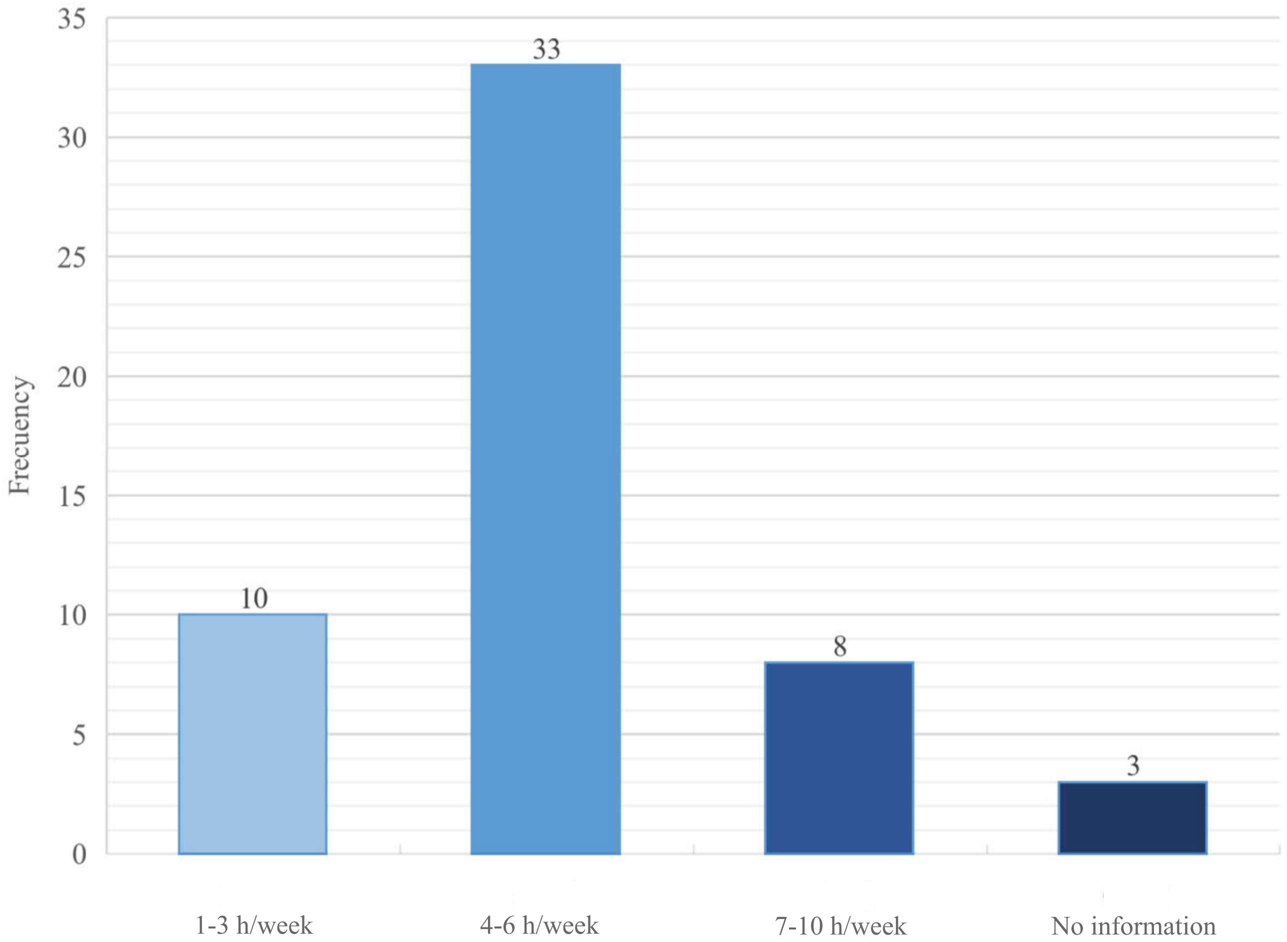
Nr.	CAT50%	Workload/week	
1	13.18%	5-6 h/week	1
2	5.34%	No information	3
3	8.42%	4-5 h/week	1
4	8.19%	No information	3
5	4.37%	4-6 h/week	1
6	4.81%	6 h/week	1
7	1.86%	3-4 h/week	1
8	24.20%	6 h/week	1
9	11.35%	2-4 h/week	1
10	8.57%	4-5 h/week	1
11	1.70%	6-8 h/week	2
12	29.23%	7-13 h/week	2
13	24.86%	5 h/week	1
14	4.82%	1-3 h/ week	0
15	1.94%	3-4 h/week	1
16	9.97%	4-5 h/week	1
17	4.10%	2-3 h/week	0
18	6.71%	6-8 h/week	2
19	9.22%	2-3 h/week	0
20	1.01%	5-6 h/week	1

21	2.77%	6 h/week	1
22	9.60%	2-3 h/week	0
23	4.99%	3-4 h/week	1
24	6.57%	No information	3
25	8.97%	3-5 h/week	1
26	8.17%	4-7 h/week	2
27	12.57%	4 h/week	1
28	12.10%	4-5 h/week	1
29	9.37%	3-4 h/week	1
30	3.08%	5-8h/week	2
31	2.22%	5-7h/week	2
32	10.06%	4-6 h/week	1
33	11.47%	4-6 h/week	1
34	29.75%	6 h/week	1
35	4.25%	5-6 h/week	1
36	5.29%	5-6 h/week	1
37	11.73%	4-6 h/week	1
38	15.40%	4-6 h/week	1
39	32.54%	4-6 h/week	1
40	11.42%	5-7 h/week	2
41	27.37%	4-6 h/week	1
42	4.68%	8-10 h/week	2
43	19.41%	2-3 h/week	0
44	8.92%	approx. 2-4 h/week	1

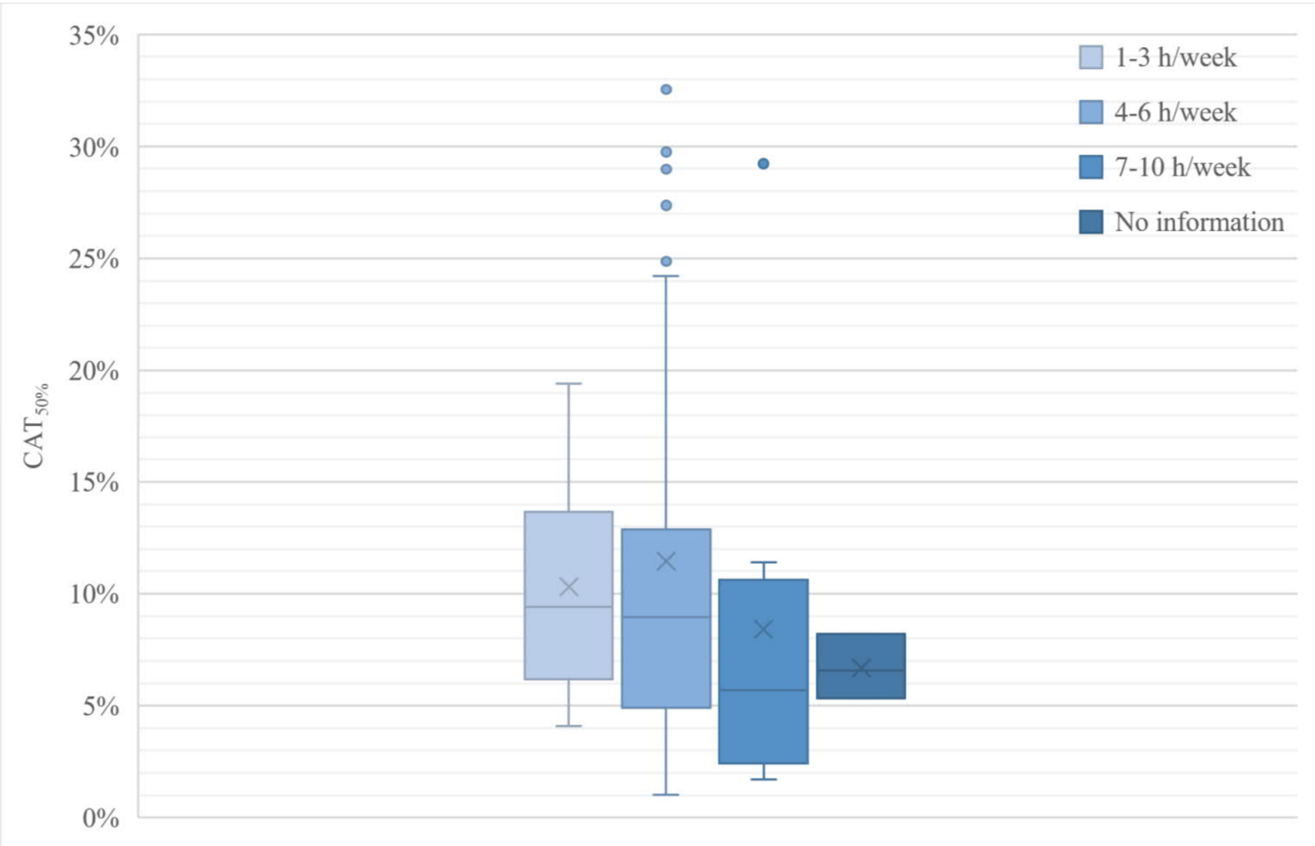
45	9.11%	approx. 2-3 h/week	0
46	8.27%	4-6 h/week	1
47	4.54%	4-6 h/week	1
48	12.41%	2-3 h/week	0
49	6.65%	1-3 h/week	0
50	5.83%	4-6 h/week	1
51	10.55%	2-3 h/week	0
52	17.35%	1-3 h/week	0
53	8.76%	4-6 h/week	1
54	28.98%	4-6 h/week	1



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
1-3 h/week
4-6 h/week
7-10 h/week
No information



35
30
25
20
15
10
5
0
Frecuency
33
10
8
3
1-3 h/week
4-6 h/week
7-10 h/week
No information



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1-3 h/week
4-6 h/week
7-10 h/week
No information

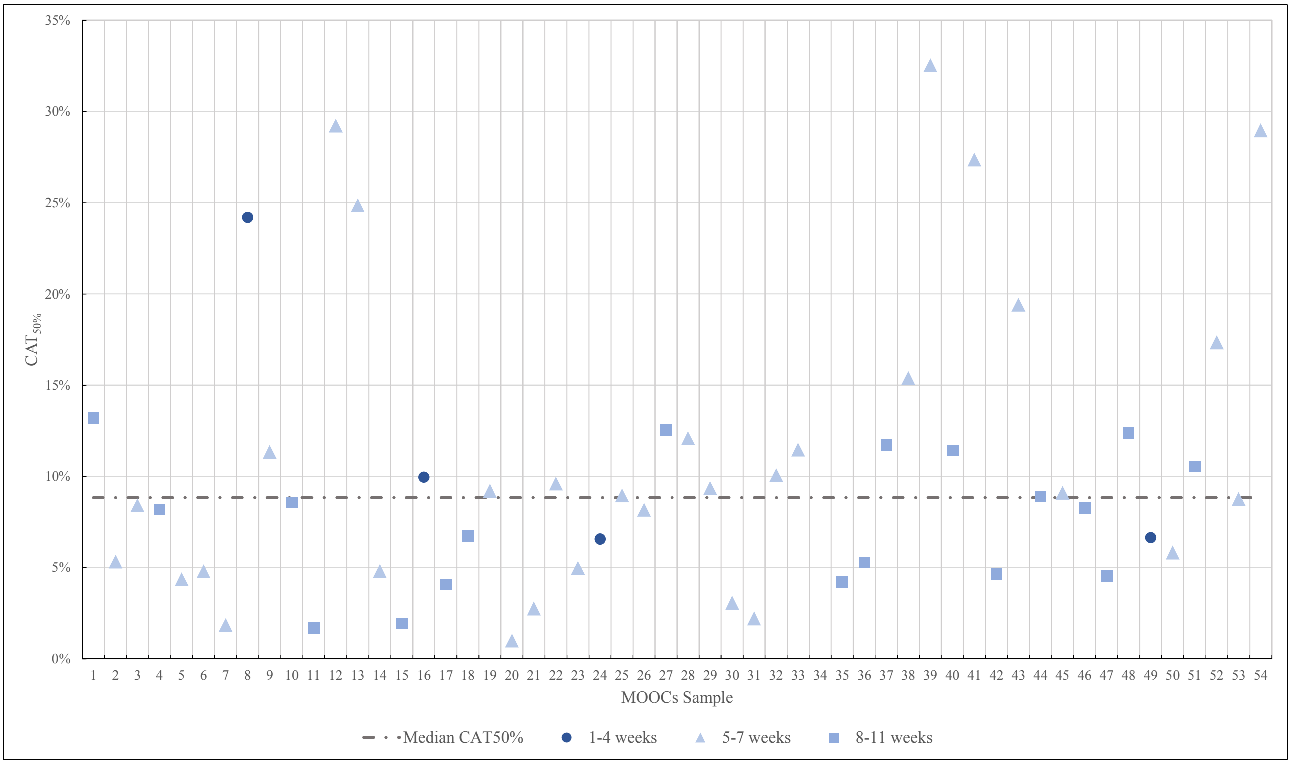
Appendix 16. Course structure

Legend:
(0): 1-4 weeks
(1): 5-7 weeks
(2): 8-11 weeks

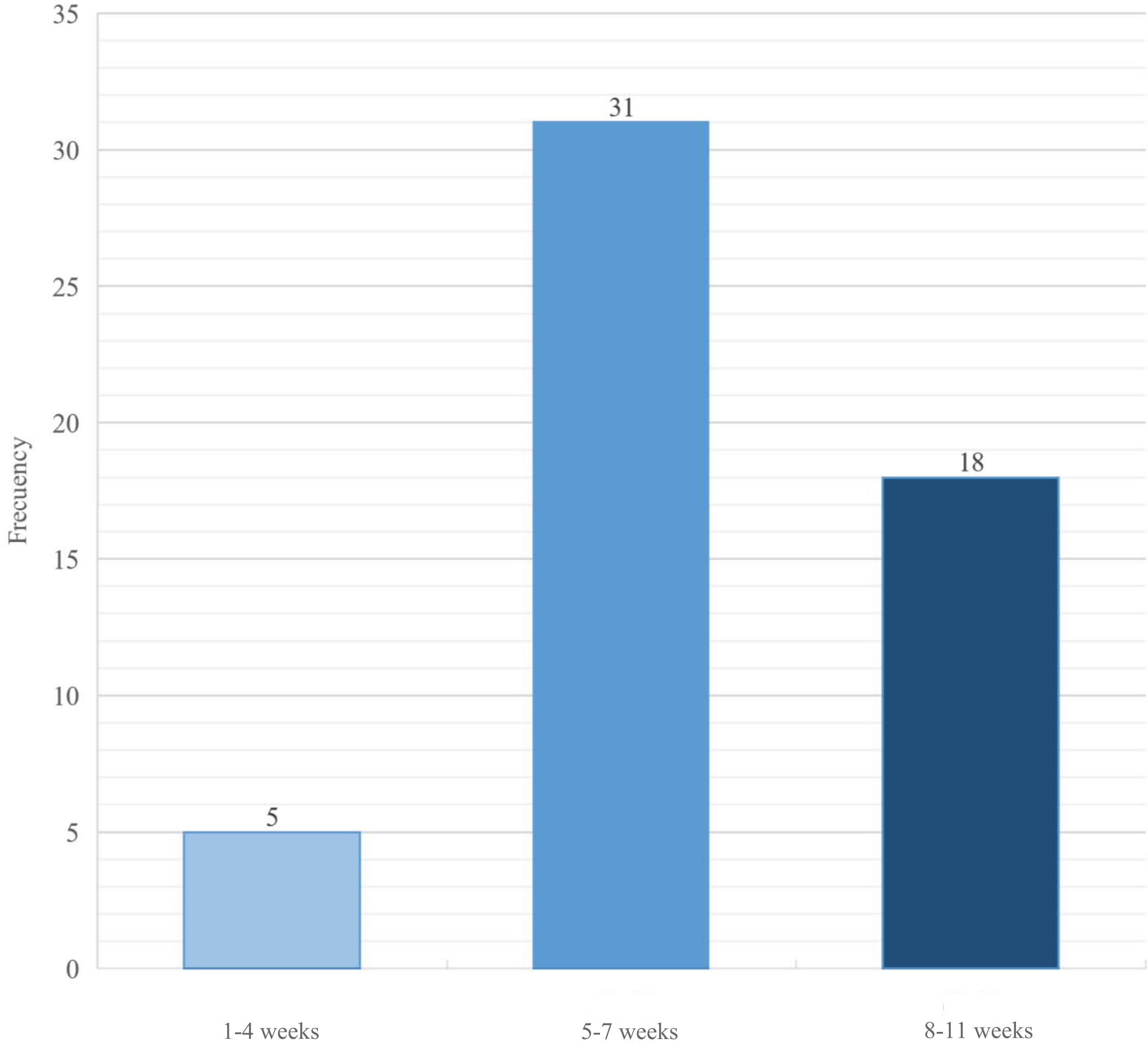
Nr.	CAT50%	Course structure	
1	13.18%	25 h / 12 weeks	2
2	5.34%	7 weeks	1
3	8.42%	7 weeks	1
4	8.19%	8 weeks	2
5	4.37%	27 h / 7 weeks	1
6	4.81%	6 weeks	1
7	1.86%	7 weeks	1
8	24.20%	4 weeks	0
9	11.35%	7 weeks	1
10	8.57%	8 weeks	2
11	1.70%	8 weeks	2
12	29.23%	6 weeks	1
13	24.86%	6 weeks	1
14	4.82%	6 weeks	1
15	1.94%	10 weeks	2
16	9.97%	4 weeks	0
17	4.10%	10 weeks	2
18	6.71%	10 weeks	2
19	9.22%	6 weeks	1
20	1.01%	7 weeks	1

21	2.77%	5 weeks	1
22	9.60%	7 weeks	1
23	4.99%	6 weeks	1
24	6.57%	4 weeks	0
25	8.97%	7 weeks	1
26	8.17%	37 h / 7 weeks	1
27	12.57%	34 h / 8 weeks	2
28	12.10%	30 h / 7 weeks	1
29	9.37%	7 weeks	1
30	3.08%	6 weeks	1
31	2.22%	7 weeks	1
32	10.06%	7 weeks	1
33	11.47%	7 weeks	1
34	29.75%	4 weeks	0
35	4.25%	10 weeks	2
36	5.29%	8 weeks	2
37	11.73%	8 weeks	2
38	15.40%	7 weeks	1
39	32.54%	14h / 5 weeks	1
40	11.42%	5-7 h/week / 9 weeks	2
41	27.37%	approx. 11 h to complete / 5 weeks	1
42	4.68%	approx. 31h to complete / 8 weeks	2
43	19.41%	approx. 12h / week / 5 weeks	1
44	8.92%	approx. 2-4h/week / 8 weeks	2

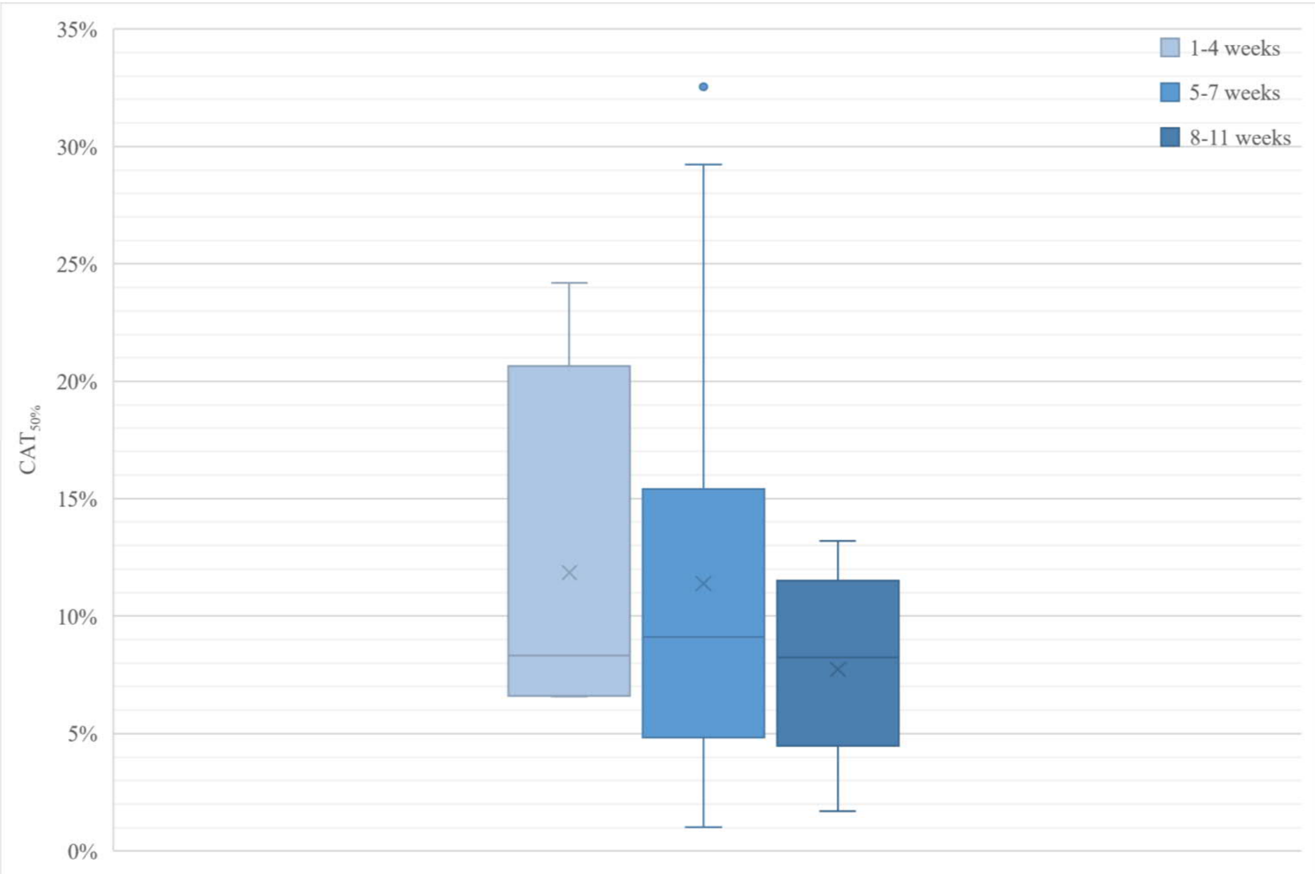
45	9.11%	2 or 3h/week / 7 weeks	1
46	8.27%	10 weeks	2
47	4.54%	approx. 44h to complete / 11 weeks	2
48	12.41%	10 weeks	2
49	6.65%	approx. 19h to complete / 4 weeks	0
50	5.83%	6 weeks	1
51	10.55%	11 weeks	2
52	17.35%	approx. 13h to complete / 5 weeks	1
53	8.76%	approx. 14h to complete / 5 weeks	1
54	28.98%	approx. 11 h to complete / 5 weeks	1



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
1-4 weeks
5-7 weeks
8-11 weeks



35
30
25
20
15
10
5
0
Frecuency
31
18
5
1-4 weeks
5-7 weeks
8-11 weeks



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1-4 weeks
5-7 weeks
8-11 weeks

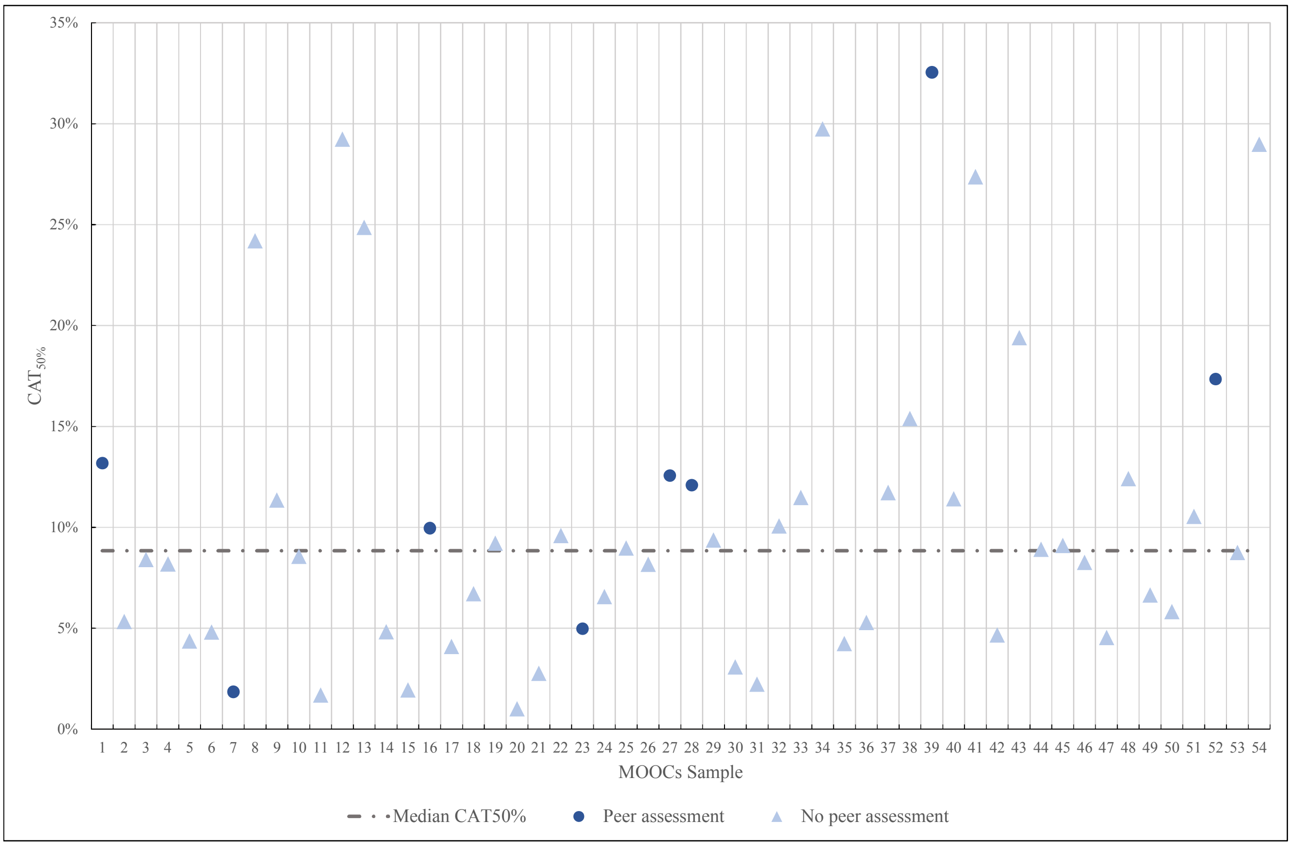
Appendix 17. Peer assessment

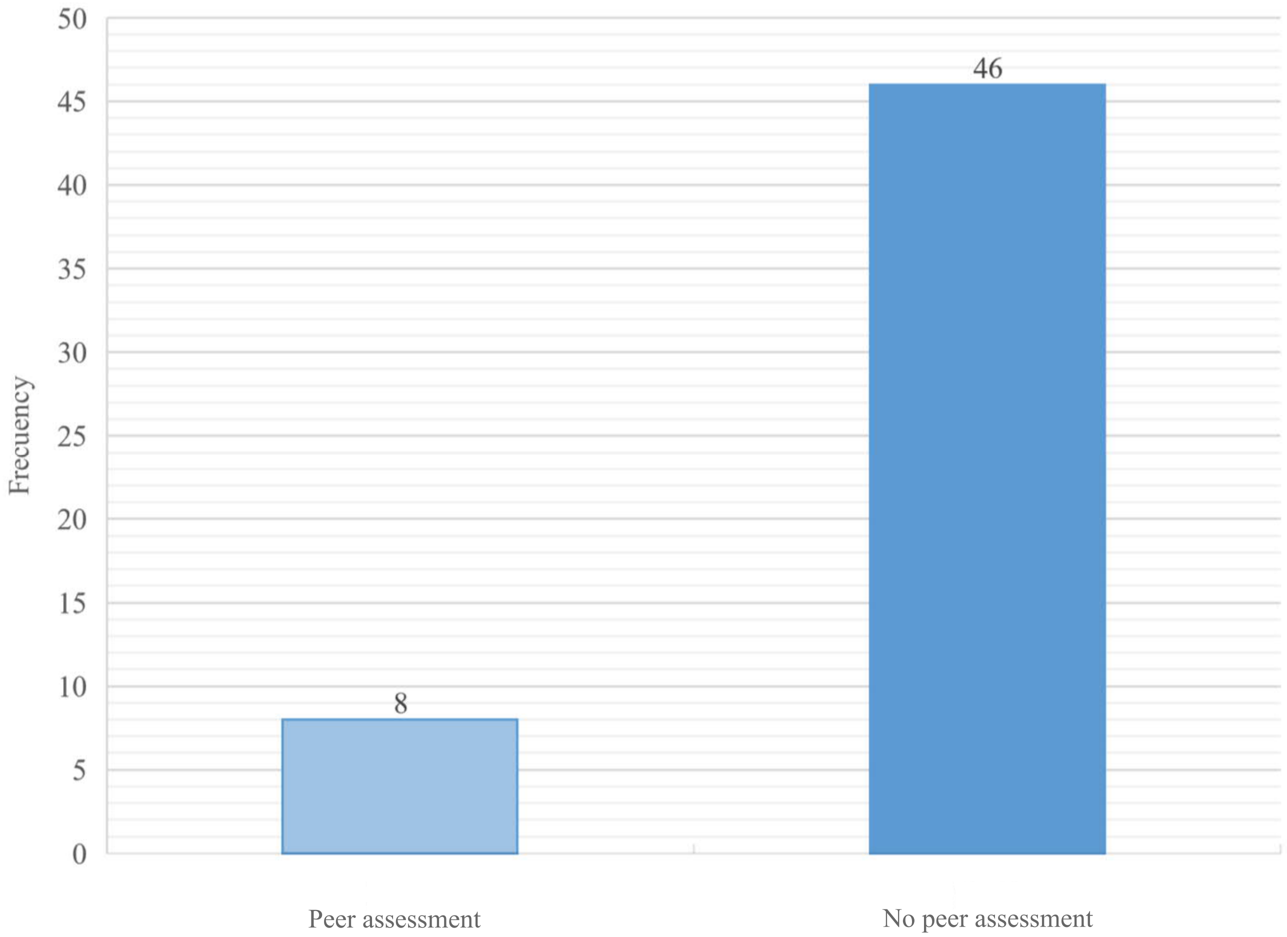
<u>**Legend:**</u>
(1): Peer-review, peer assessment
(2): No peer-review, no peer assessment

Nr.	CAT50%	Peer assessment	
1	13.18%	Peer assessment	1
2	5.34%	No peer assessment	2
3	8.42%	No peer assessment	2
4	8.19%	No peer assessment	2
5	4.37%	No peer assessment	2
6	4.81%	No peer assessment	2
7	1.86%	Peer assessment	1
8	24.20%	No peer assessment	2
9	11.35%	No peer assessment	2
10	8.57%	No peer assessment	2
11	1.70%	No peer assessment	2
12	29.23%	No peer assessment	2
13	24.86%	No peer assessment	2
14	4.82%	No peer assessment	2
15	1.94%	No peer assessment	2
16	9.97%	Peer assessment	1
17	4.10%	No peer assessment	2
18	6.71%	No peer assessment	2
19	9.22%	No peer assessment	2
20	1.01%	No peer assessment	2

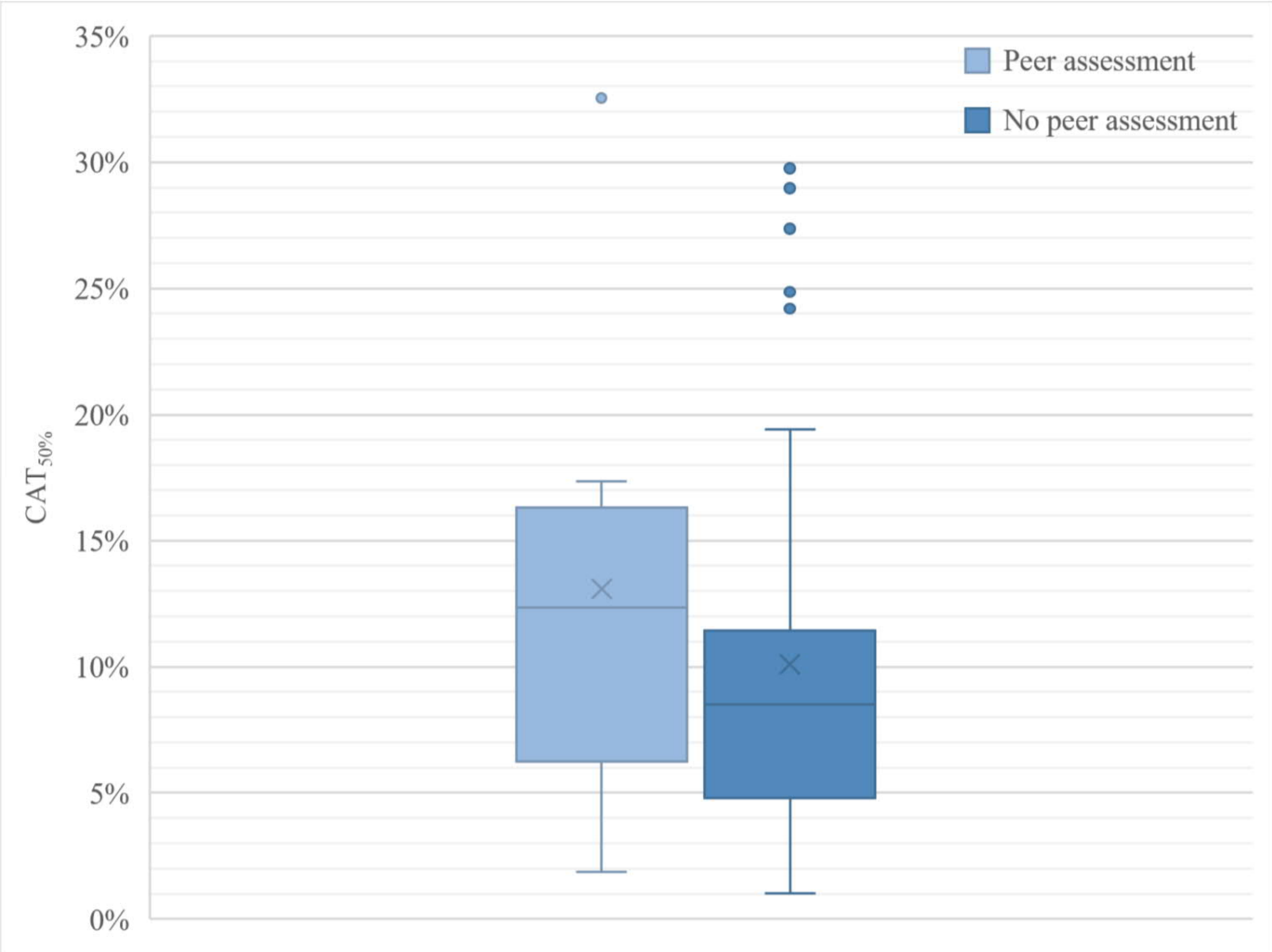
21	2.77%	No peer assessment	2
22	9.60%	No peer assessment	2
23	4.99%	Peer assessment	1
24	6.57%	No peer assessment	2
25	8.97%	No peer assessment	2
26	8.17%	No peer assessment	2
27	12.57%	Peer assessment	1
28	12.10%	Peer assessment	1
29	9.37%	No peer assessment	2
30	3.08%	No peer assessment	2
31	2.22%	No peer assessment	2
32	10.06%	No peer assessment	2
33	11.47%	No peer assessment	2
34	29.75%	No peer assessment	2
35	4.25%	No peer assessment	2
36	5.29%	No peer assessment	2
37	11.73%	No peer assessment	2
38	15.40%	No peer assessment	2
39	32.54%	Peer assessment	1
40	11.42%	No peer assessment	2
41	27.37%	No peer assessment	2
42	4.68%	No peer assessment	2
43	19.41%	No peer assessment	2
44	8.92%	No peer assessment	2

45	9.11%	No peer assessment	2
46	8.27%	No peer assessment	2
47	4.54%	No peer assessment	2
48	12.41%	No peer assessment	2
49	6.65%	No peer assessment	2
50	5.83%	No peer assessment	2
51	10.55%	No peer assessment	2
52	17.35%	Peer assessment	1
53	8.76%	No peer assessment	2
54	28.98%	No peer assessment	2


35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Peer assessment
No peer assessment



50
45
40
35
30
25
20
15
10
5
0
Frecuency
46
8
Peer assessment
No peer assessment


35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
Peer assessment
No peer assessment

Appendix 18. Welcoming lecture video

Legend:

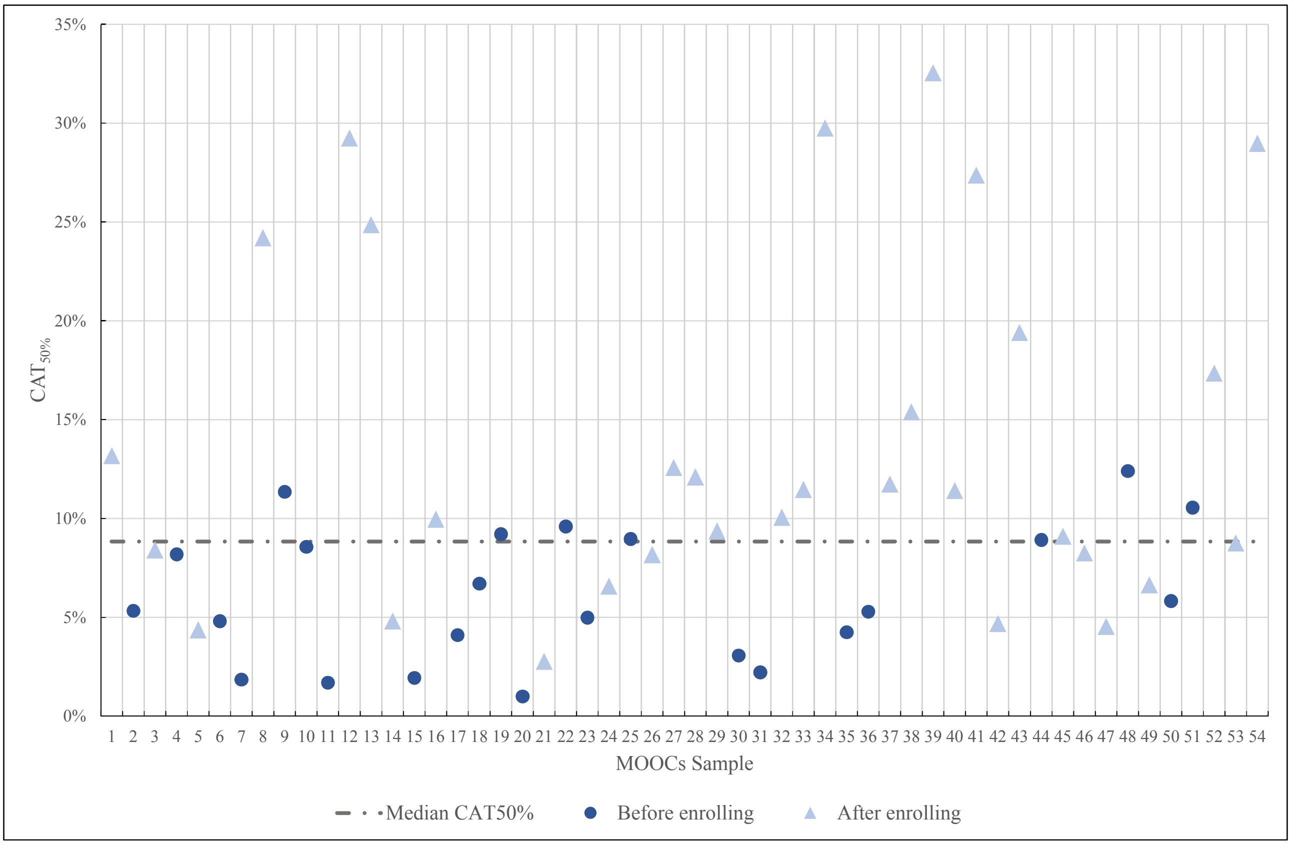
(0): A welcoming video before enrolling in the course.

(1): A welcoming video after enrolling in the course.

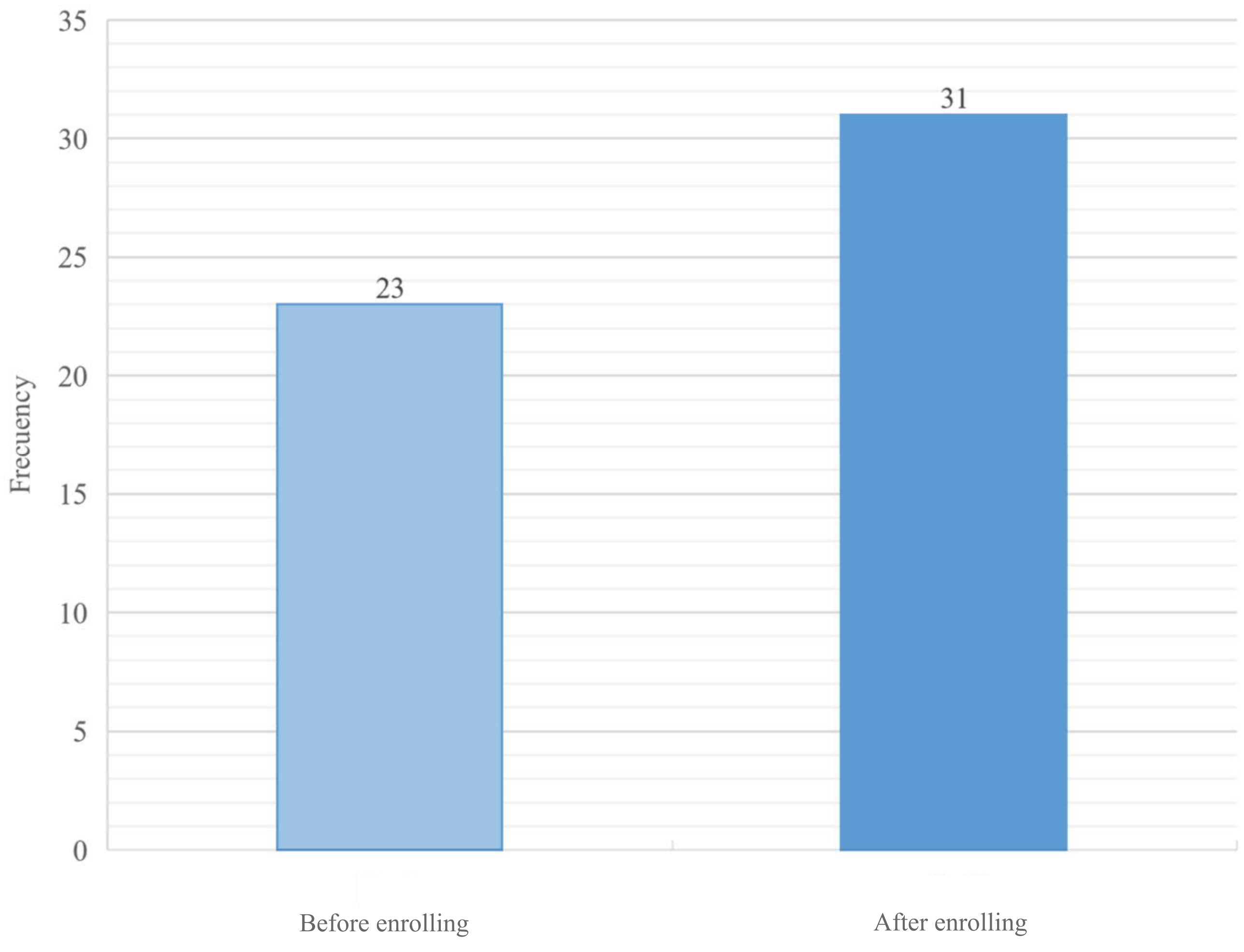
Nr.	CAT50%	Welcoming video	
1	13.18%	A welcoming video after enrolling in the course	1
2	5.34%	A welcoming video before enrolling in the course	0
3	8.42%	A welcoming video after enrolling in the course	1
4	8.19%	A welcoming video before enrolling in the course	0
5	4.37%	A welcoming video after enrolling in the course	1
6	4.81%	A welcoming video before enrolling in the course	0
7	1.86%	A welcoming video before enrolling in the course	0
8	24.20%	A welcoming video after enrolling in the course	1
9	11.35%	A welcoming video before enrolling in the course	0
10	8.57%	A welcoming video before enrolling in the course	0
11	1.70%	A welcoming video before enrolling in the course	0
12	29.23%	A welcoming video after enrolling in the course	1
13	24.86%	A welcoming video after enrolling in the course	1
14	4.82%	A welcoming video after enrolling in the course	1
15	1.94%	A welcoming video before enrolling in the course	0
16	9.97%	A welcoming video after enrolling in the course	1
17	4.10%	A welcoming video before enrolling in the course	0
18	6.71%	A welcoming video before enrolling in the course	0
19	9.22%	A welcoming video before enrolling in the course	0
20	1.01%	A welcoming video before enrolling in the course	0

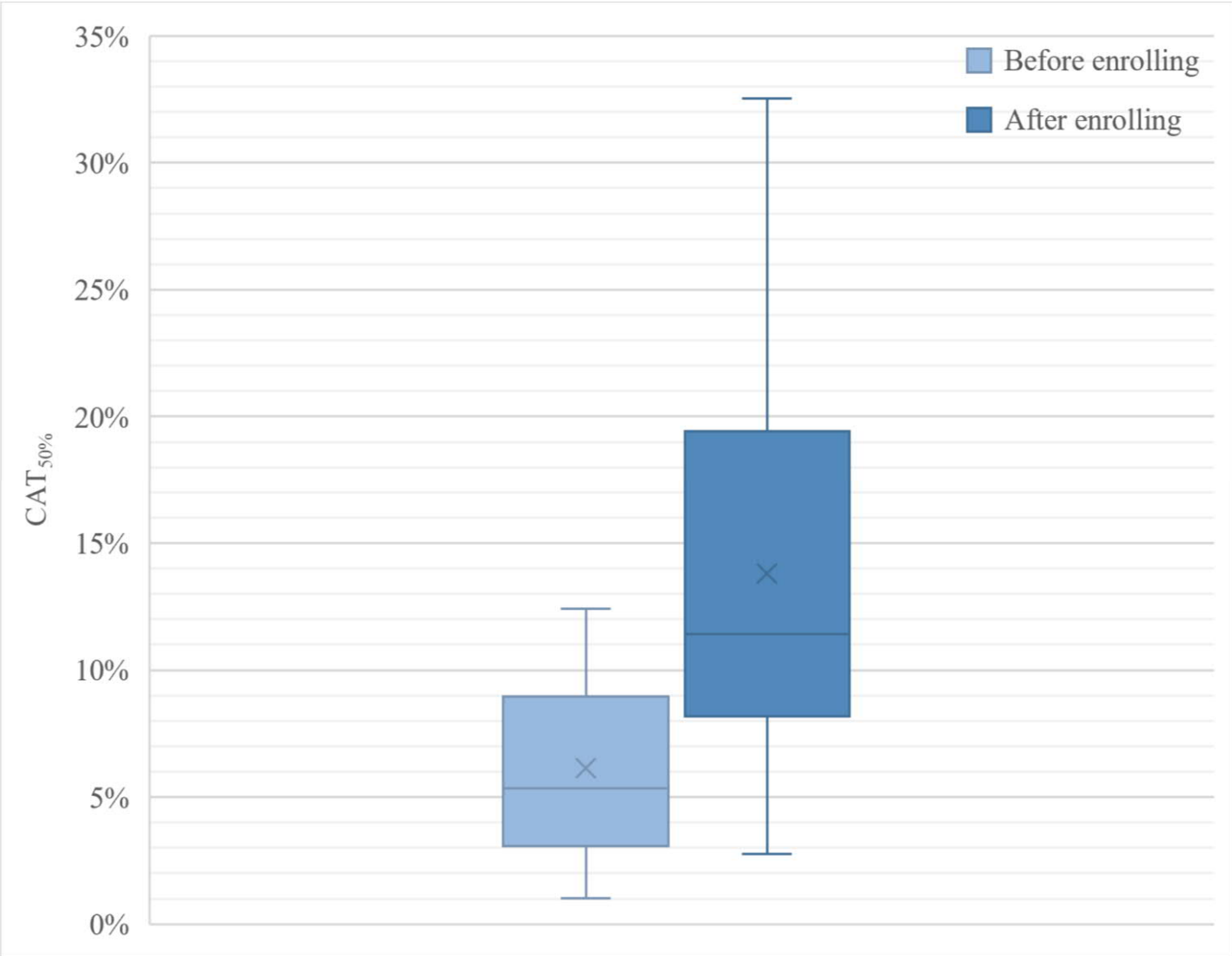
21	2.77%	A welcoming video after enrolling in the course	1
22	9.60%	A welcoming video before enrolling in the course	0
23	4.99%	A welcoming video before enrolling in the course	0
24	6.57%	A welcoming video after enrolling in the course	1
25	8.97%	A welcoming video before enrolling in the course	0
26	8.17%	A welcoming video after enrolling in the course	1
27	12.57%	A welcoming video after enrolling in the course	1
28	12.10%	A welcoming video after enrolling in the course	1
29	9.37%	A welcoming video after enrolling in the course	1
30	3.08%	A welcoming video before enrolling in the course	0
31	2.22%	A welcoming video before enrolling in the course	0
32	10.06%	A welcoming video after enrolling in the course	1
33	11.47%	A welcoming video after enrolling in the course	1
34	29.75%	A welcoming video after enrolling in the course	1
35	4.25%	A welcoming video before enrolling in the course	0
36	5.29%	A welcoming video before enrolling in the course	0
37	11.73%	A welcoming video after enrolling in the course	1
38	15.40%	A welcoming video after enrolling in the course	1
39	32.54%	A welcoming video after enrolling in the course	1
40	11.42%	A welcoming video after enrolling in the course	1
41	27.37%	A welcoming video after enrolling in the course	1
42	4.68%	A welcoming video after enrolling in the course	1
43	19.41%	A welcoming video after enrolling in the course	1
44	8.92%	A welcoming video before enrolling in the course	0

45	9.11%	A welcoming video after enrolling in the course	1
46	8.27%	A welcoming video after enrolling in the course	1
47	4.54%	A welcoming video after enrolling in the course	1
48	12.41%	A welcoming video before enrolling in the course	0
49	6.65%	A welcoming video after enrolling in the course	1
50	5.83%	A welcoming video before enrolling in the course	0
51	10.55%	A welcoming video before enrolling in the course	0
52	17.35%	A welcoming video after enrolling in the course	1
53	8.76%	A welcoming video after enrolling in the course	1
54	28.98%	A welcoming video after enrolling in the course	1



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
Before enrolling
After enrolling


35
30
25
20
15
10
5
0
Frecuency
23
31
Before enrolling
After enrolling



35%
30%
25%
20%
15%
10%
5%
0%
$CAT_{50\%}$
Before enrolling
After enrolling

Appendix 19. Marketing information

Legend:

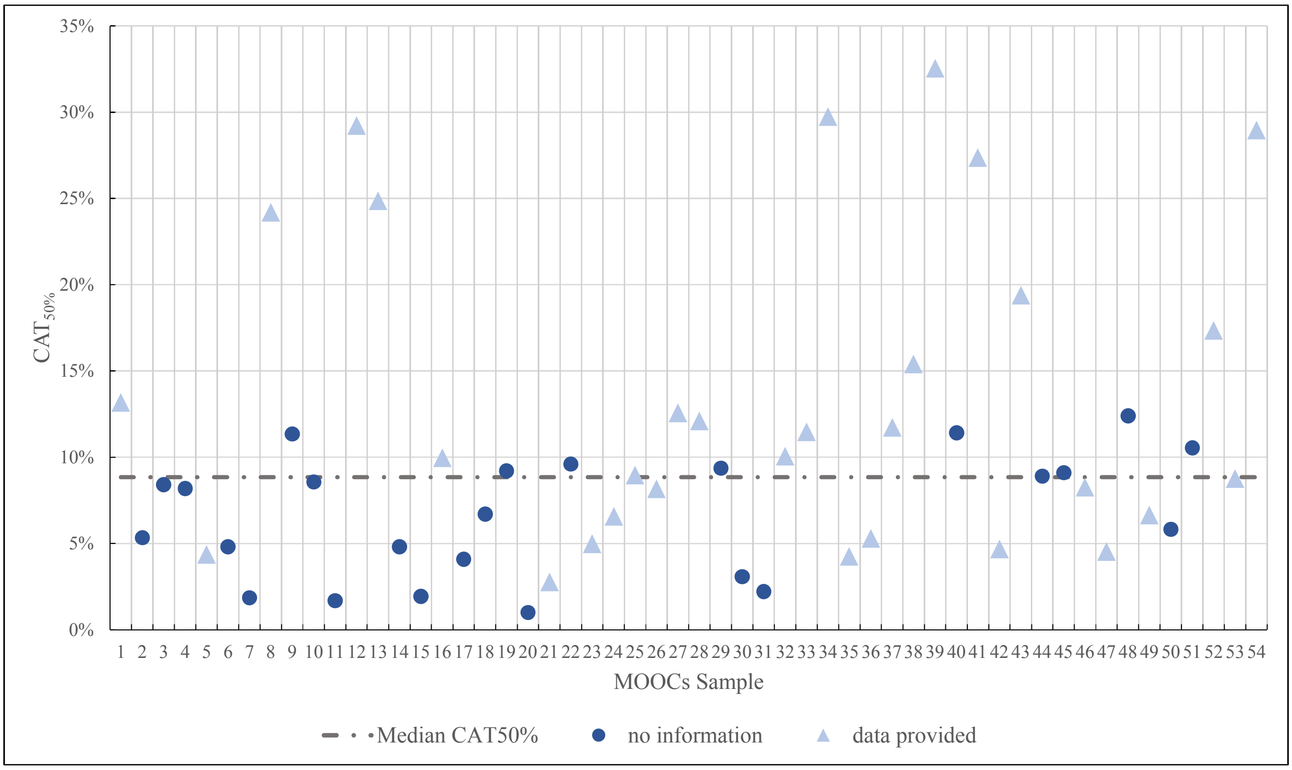
(0) There is no information about the rating by users, the number of ratings and the number of reviews of the course

(1) One or more of these data are provided: the rating by users, the number of ratings and the number of reviews of the course

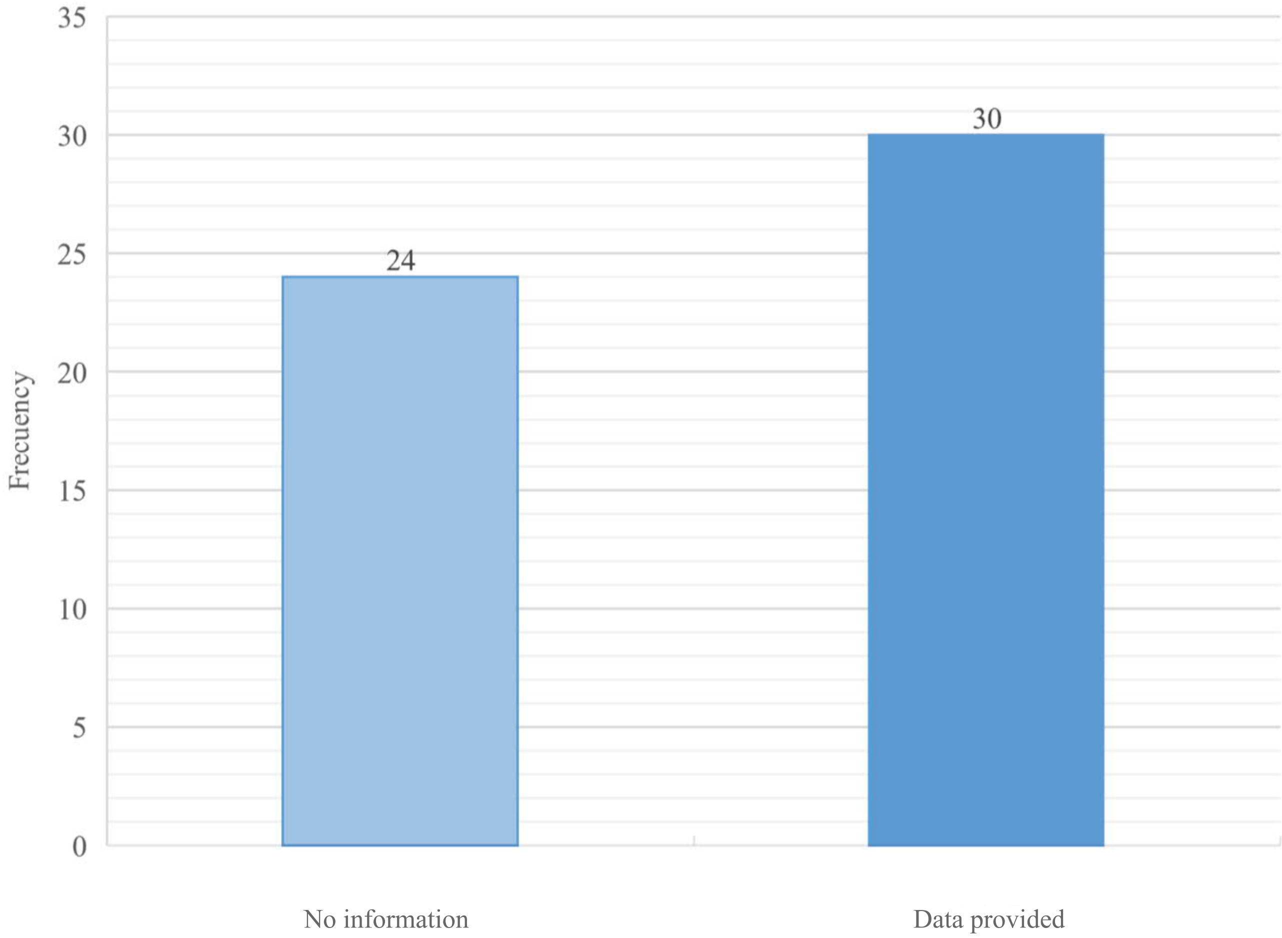
Nr.	CAT50%	Marketing info	
1	13.18%	4527 reviews	1
2	5.34%	no information	0
3	8.42%	no information	0
4	8.19%	no information	0
5	4.37%	4 reviews	1
6	4.81%	no information	0
7	1.86%	no information	0
8	24.20%	435 reviews	1
9	11.35%	no information	0
10	8.57%	no information	0
11	1.70%	no information	0
12	29.23%	481 reviews	1
13	24.86%	1368 reviews	1
14	4.82%	no information	0
15	1.94%	no information	0
16	9.97%	2 reviews	1
17	4.10%	no information	0
18	6.71%	no information	0
19	9.22%	no information	0

20	1.01%	no information	0
21	2.77%	32 reviews	1
22	9.60%	no information	0
23	4.99%	Learner testimonial	1
24	6.57%	Learner testimonial	1
25	8.97%	Learner testimonial	1
26	8.17%	19 reviews	1
27	12.57%	no information	1
28	12.10%	18 reviews	1
29	9.37%	no information	0
30	3.08%	no information	0
31	2.22%	no information	0
32	10.06%	57 reviews	1
33	11.47%	65 reviews	1
34	29.75%	249 reviews	1
35	4.25%	Learner testimonial	1
36	5.29%	Learner testimonial	1
37	11.73%	89 reviews	1
38	15.40%	88 reviews	1
39	32.54%	42 reviews	1
40	11.42%	no information	0
41	27.37%	188 reviews	1
42	4.68%	146 reviews	1
43	19.41%	144 reviews	1

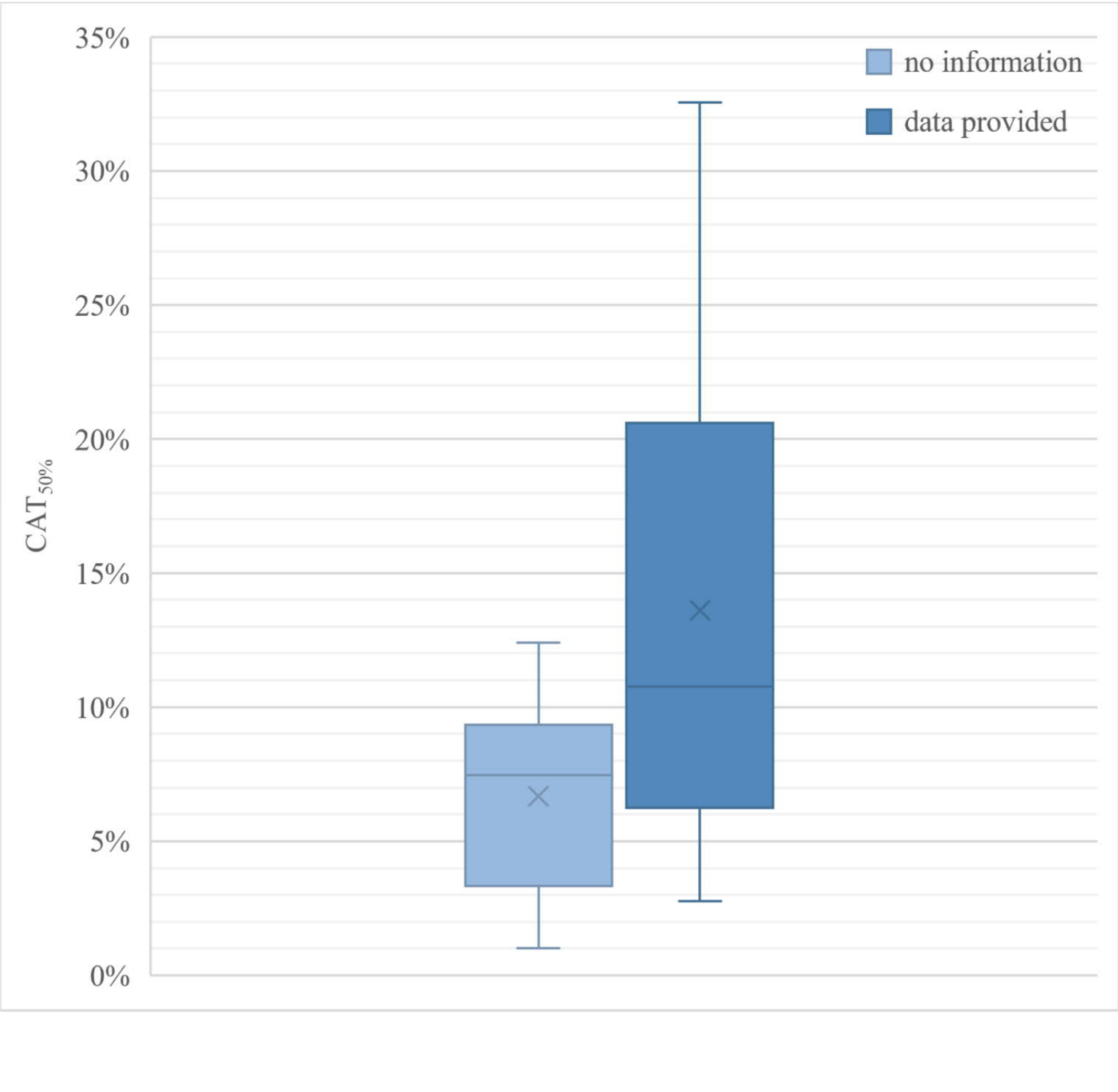
44	8.92%	no information	0
45	9.11%	no information	0
46	8.27%	no information	1
47	4.54%	no information	1
48	12.41%	no information	0
49	6.65%	8 reviews	1
50	5.83%	no information	0
51	10.55%	no information	0
52	17.35%	103 reviews	1
53	8.76%	586 reviews	1
54	28.98%	78 reviews	1



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
no information
data provided



35
30
25
20
15
10
5
0
Frecuency
24
30
No information
Data provided



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
no information
data provided

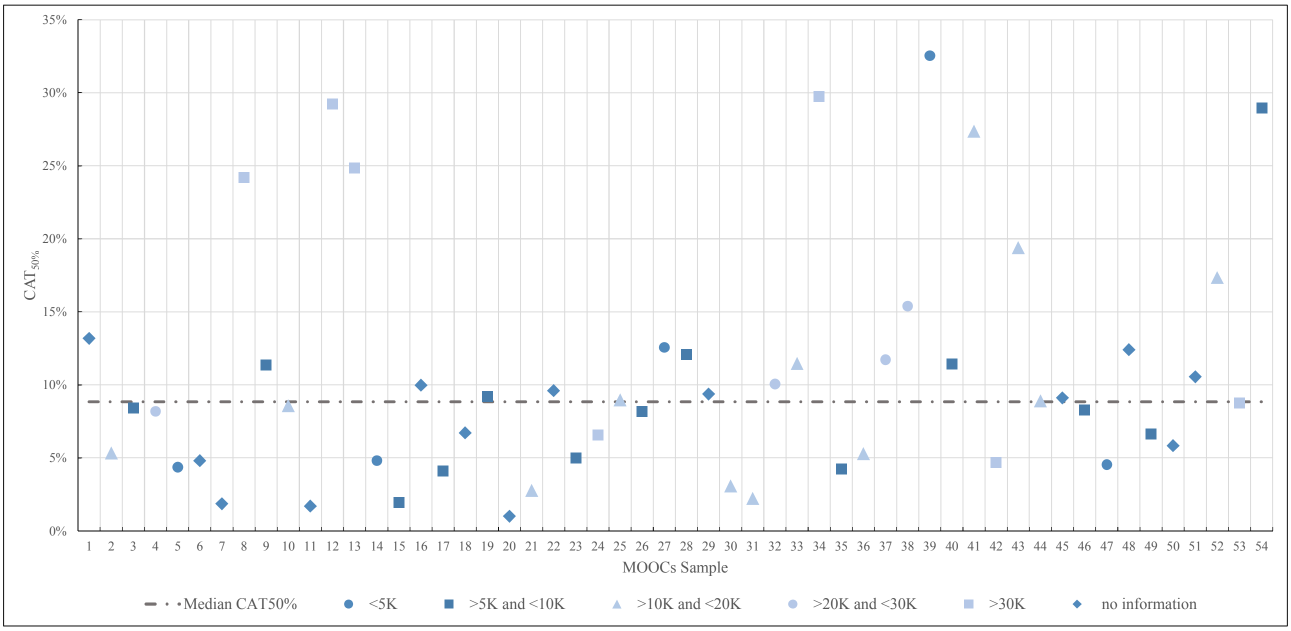
Appendix 20. Number of students already enrolled

Legend:
(0) no information
(1) From 1 to 5'000
(2) From 5'001 to 10'000
(3) From 10'001 to 20'000
(4) From 20'001 to 30'000
(5) More than 30'000

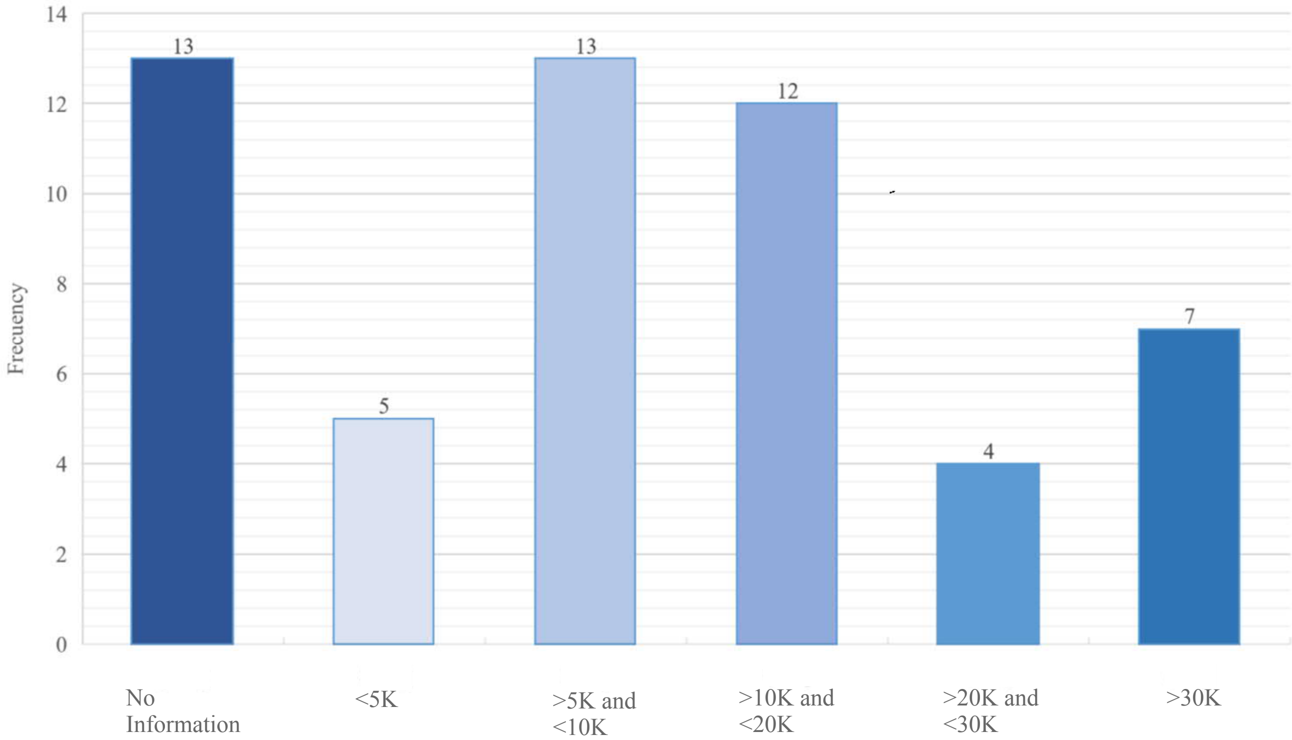
Nr.	CAT50%	Enrolled number	
1	13.18%	no information	0
2	5.34%	15409	3
3	8.42%	8205	2
4	8.19%	27037	4
5	4.37%	1693	1
6	4.81%	no information	0
7	1.86%	no information	0
8	24.20%	70350	5
9	11.35%	6705	2
10	8.57%	14448	3
11	1.70%	no information	0
12	29.23%	47941	5
13	24.86%	163487	5
14	4.82%	2615	1
15	1.94%	5133	2
16	9.97%	no information	0
17	4.10%	9951	2
18	6.71%	no information	0

19	9.22%	8612	2
20	1.01%	no information	0
21	2.77%	16170	3
22	9.60%	no information	0
23	4.99%	5410	2
24	6.57%	61585	5
25	8.97%	13918	3
26	8.17%	6964	2
27	12.57%	2426	1
28	12.10%	6829	2
29	9.37%	no information	0
30	3.08%	10318	3
31	2.22%	16424	3
32	10.06%	22878	4
33	11.47%	15916	3
34	29.75%	47240	5
35	4.25%	5790	2
36	5.29%	11995	3
37	11.73%	26665	4
38	15.40%	25778	4
39	32.54%	3751	1
40	11.42%	7414	2
41	27.37%	16442	3
42	4.68%	58439	5

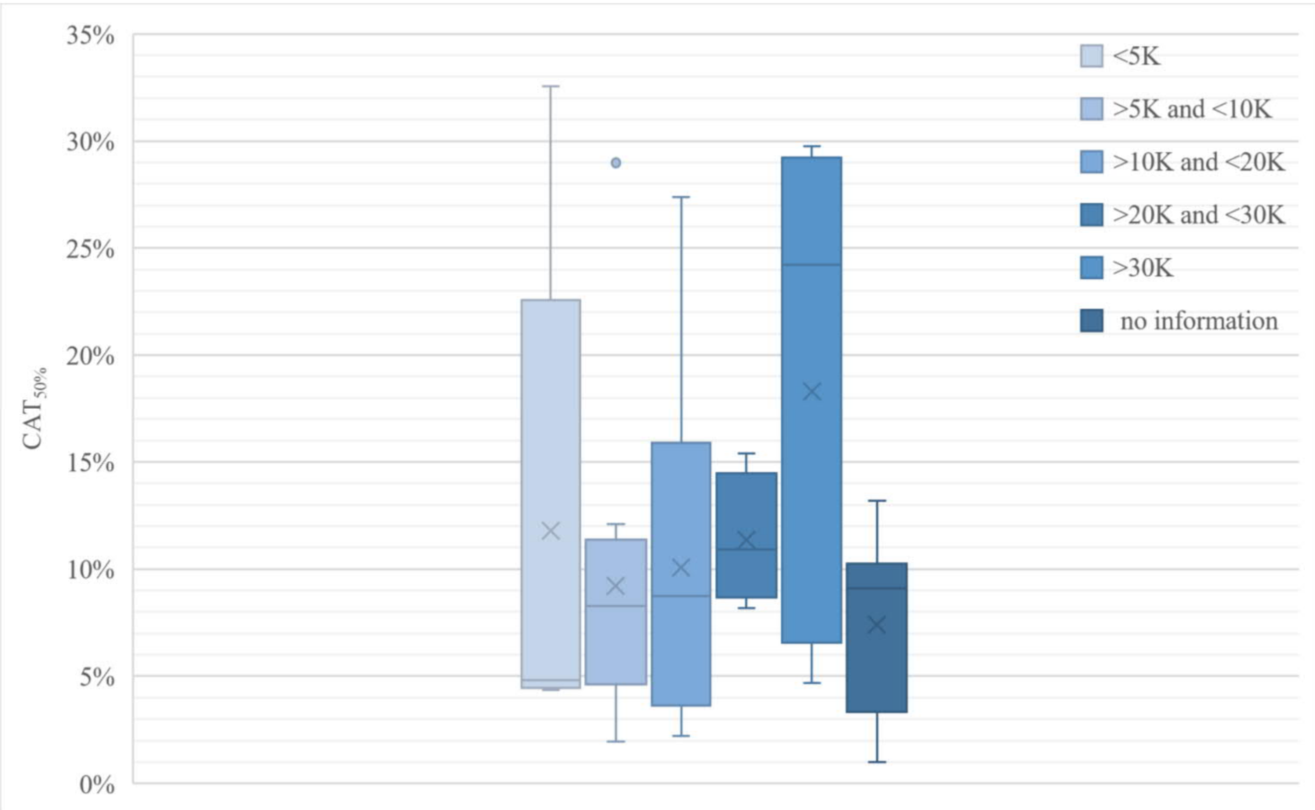
43	19.41%	18172	3
44	8.92%	19407	3
45	9.11%	no information	0
46	8.27%	5436	2
47	4.54%	3255	1
48	12.41%	no information	0
49	6.65%	6916	2
50	5.83%	no information	0
51	10.55%	no information	0
52	17.35%	17670	3
53	8.76%	51583	5
54	28.98%	8231	2



35%
30%
25%
20%
15%
10%
5%
0%
CAT50%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
MOOCs Sample
Median CAT50%
<5K
>5K and <10K
>10K and <20K
>20K and <30K
>30K
no information



Frecuency
14
12
10
8
6
4
2
0
13
5
13
12
4
7
No Information
<5K
>5K and <10K
>10K and <20K
>20K and <30K
>30K



35%
30%
25%
20%
15%
10%
5%
0%
CAT$_{50\%}$
<5K
>5K and <10K
>10K and <20K
>20K and <30K
>30K
no information