RESEARCH ARTICLE

MOOCs 2012-2022: An overview

Stamatios Papadakis

Pedagogical Department of Preschool Education, University of Crete, Crete, Greece

Correspondence to: Stamatios Papadakis, Pedagogical Department of Preschool Education, University of Crete, Crete, Greece; Email: stpapadakis@gmail.com

Abstract: Online learning has proven its effectiveness recently, especially during the coronavirus outbreak [COVID-19] that forced the closure of educational institutions in most countries. Many see MOOCs as an alternative to the traditional education system due to the flexibility of learning time and the absence of economic and geographical constraints. People can access educational content for free through platforms that deliver online learning content. However, MOOCs have long-standing challenges that need to be addressed. These include high dropout rates and reduced user participation in learning activities such as forums and comments. Furthermore, international research has identified a need for more relevant knowledge, despite the importance experts ascribe to MOOCs for delivering educational content. To this end, this chapter examines the establishment of MOOCs in terms of their pedagogical and technological dimensions, starting with a definition and a brief history of MOOCs. To this end, the characteristics of MOOCs will be reviewed. The practical issues that have emerged from more than ten years of experience in implementing MOOCs at the international level will also be considered.

Keywords: MOOC, Massive Open Online Course, cMOOC, xMOOC

1 Introduction

Over the last few years, education has dramatically changed how learning content is delivered (Alhazzani, 2020). This is partly due to the increased use of ICT, not just as a technology tool but as a practice for improving learning. This includes e-learning platforms, creating Web 2.0 tools like blogs, wikis and social networks, but also continuously developing new pedagogical methodologies like collaborative teaching (García-Martín & García-Sánchez, 2020).

Furthermore, the recent pandemic has changed our mindset, the speed of knowledge production and how we view education. As a result, the popularity of learning through MOOCs (Massive Open Online Courses) has increased to an excessive degree (Shah, 2021). It has become an alternative learning platform compared to traditional live courses, where an acceptable level of support and interaction with the instructor is provided within a set time frame (Loizzo & Ertmer, 2016). In recent years (Gomez et al., 2022), the most popular online courses (MOOCs) providers, such as Coursera or edX, report that millions of new users have registered on their platforms. By the end of 2021, the number of registered users in MOOC programmes will have risen to 220 million, according to statistics from ClassCentral (https://www.classcentral.com), a search engine website for MOOCs, excluding China (an increase of 40 million users compared to 2020). Correspondingly (Shah, 2021), the number of MOOCs offered has reached 19,400. MOOC platforms were established later in Asia than in North America and Europe. However, they are growing just as fast. In China (Zhao et al., 2022), MOOCs reached 15,000 and 270 million users by August 2019.

MOOCs are a form of online learning with many registered users. Because of their open nature and their potential to reach a wider audience, many researchers and education professionals recognise their contribution to the modernisation and democratisation of higher education and, therefore, their potential to remove barriers to the high-quality education offered by renowned university institutions (Wei, Saab, & Admiraal, 2021). The term MOOC stands for open access to a global learning environment that provides access to educational content - in the form of digital data in multiple formats and alternative forms of interaction - to a significant number of registered users anywhere and at any time.

MOOCs have attracted the interest of the education and research community (Baturay, 2015) due to their spatial and temporal flexibility. The MOOC model is considered disruptive to higher education because it does not follow the traditional higher education model (Pilli et al., 2018). Unlike online courses sponsored by higher education institutions, MOOCs do not limit the number of participants, do not charge participation fees, do not require prerequisite qualifications, or participate in the course of study beyond a single course (Wei et al., 2021). Upon successful completion of a MOOC, registered users can optionally receive a certificate. This certificate is

accredited through a partnership between the MOOC provider and the educational institution that created the course.

However, despite the enormous opportunities that MOOCs represent for the democratisation of education, research in the international literature has highlighted weaknesses in the pedagogy of MOOCs, the participation and social networking of students and teachers, as well as inconsistencies in the proper integration of technology to create an adaptive online environment compatible with the teaching and learning process (Castellanos-Reyes, 2021). Furthermore, other research has shown that most students involved in the learning process through MOOCs are already educated and come from wealthy countries. This may increase educational inequalities (Ruipérez-Valiente et al., 2022).

This chapter aims to explore and provide an overview of the main topics covered in scientific publications on MOOCs from 2019 to 2022, given this dynamic development in learning content delivery through MOOCs. The results can be used for future in-depth analysis of issues related to structuring, developing and contenting MOOCs adapted to the current social and economic reality.

2   Methods

2.1   Study design

This systematic review aims to understand the development of MOOCs. To this end, the scientific literature was extracted from the Scopus database for 2020-2022. In order to provide a comprehensive overview of the literature on MOOCs, this bibliometric analysis used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). Figure 1 shows the procedure for carrying out the bibliometric mapping analysis, based on the PRISMA protocol, to minimise bias and report the results transparently and credibly. According to McBurney and Novak (2002), bibliometric analysis can be used to quantitatively explore trends in academic research and publication characteristics. It provides systematic information on quantitative publications and helps researchers identify trends and patterns.
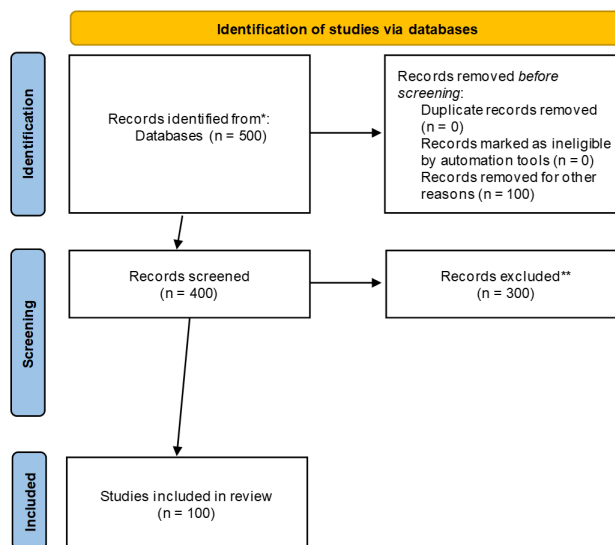

Figure 1   PRISMA flowchart of the present study

2.2   Procedure

On 10 January 2023, the documents selected for this study were retrieved from the Scopus database (https://www.scopus.com). A combination of compound keywords using the OR and AND operators was used as the search string. The command is as follows TITLE-ABS-KEY ("MOOC*") AND ("*MOOC" OR "Massive Open Online Courses*") AND (LIMIT-TO (DOCTYPE, "ar")). The asterisk (*) character is a wildcard replacement for any group of characters. For example, cMOOC, xMOOC, etc., would be found with "*MOOC". Articles containing one of the keywords in the title, abstract or keywords were selected as inclusion criteria. The variables examined were the language of publication, the year of publication, the keywords used, the documents cited, the authors cited, the active journals, the productive journals and the producing countries. Then there was an extraction of the frequency of each variable.

A specific timeframe, including published documents from 2019 to 2022, was used in the search process. Five hundred papers (journal articles) from 2019 to 2022 (including those in press) were retrieved after an initial search. Conference papers, books, book chapters, dissertations, editorials, corrections and letters were excluded from the study. Scopus filters excluded 200 irrelevant papers. These included editorials, commentaries and book reviews. In the end, 300 articles were extracted after excluding irrelevant works. From all sampled articles, all data were downloaded, including citations, bibliographic information, abstract and keywords.

3   Bibliographic review

3.1   Introduction to MOOCs

Technological developments through Web 2.0 technologies have been instrumental in the digital transformation of education and the digital empowerment of the education community. One of the most recent innovations in providing digital learning content in e-learning is the development and adoption of MOOCs (Borrella et al., 2022). Although MOOCs are a relatively recent phenomenon in education, they have received particular attention in the last decade. They represent the next stage in the evolution of open educational resources (Gómez et al., 2022) (see Figure 2). Open Educational Resources (OER) are teaching, learning and research materials in any medium released under an open licence that allows them to be accessed, used, reused and redistributed by others without restriction (Atkins, Brown & Hammond, 2007). OERs can include complete courses/syllabi, course materials, modules, teaching notes, textbooks, research articles, videos, interactives and other functional materials (UNESCO & Commonwealth of Learning, 2015). Online, e-learning or mobile learning are not synonymous with Open Educational Resources.
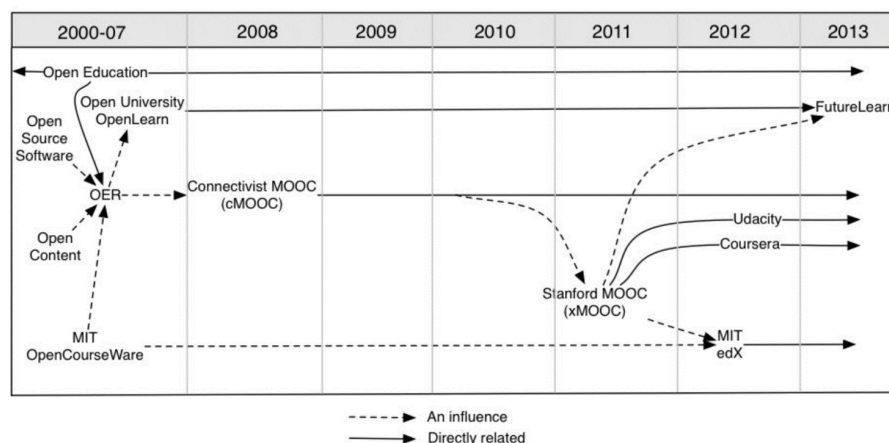

Figure 2   Open Educational Resources (OERs) and MOOCs (Yuan & Powell, 2013)

The ability of this mode of delivering learning content to escape geographical, time and human resource limitations (equipment, capital, etc.) has led to the international phenomenon of the 'MOOC craze' or 'MOOC tsunami' (Xiao et al., 2019). Unlike distance or live university courses, MOOCs do not have the formal requirements such as the educational and academic background of the students and therefore allow a potentially unlimited number of learners to participate for free on a global scale (Campos et al., 2022; Gomez et al., 2022; Sheng et al., 2022). The traditional audience for MOOCs (Gomez et al., 2022; Zhang, Gao & Zhang, 2021) is adult learners who take the courses for free or pay a small fee for a certificate of completion and do not seek formal recognition from a university institution. Upon completion of a MOOC, learners can, if they wish, obtain a certificate accredited through a partnership between the MOOC provider and the educational institution that created the course (Yu, 2022). Research has shown that those who take a MOOC and go through the certification process to obtain a certificate differ from those studying at university. They tend to be older and more interested in learning or upgrading skills and career development (Li et al., 2022).

Like traditional university courses, MOOCs were initially structured as weekly courses. However, the duration and structure of MOOCs have gradually changed to meet the needs of a heterogeneous audience in response to changing demographics and the rapid growth of a heterogeneous population of lifelong learners. They are mainly offered as short, flexible, self-paced learning materials (De Notaris et al., 2021). MOOCs offer users the opportunity to participate in discussion forums, interactive question and answer sessions, peer assessment and rewards that support interaction with the broader educational community, in addition to

traditional learning materials (e.g. lecture notes, slides, videos, assignments and quizzes) (Lambert, 2020). Many researchers have argued that MOOCs will 'disrupt' higher education by changing or reforming the higher education system. However, MOOCs are already being used as part of traditional face-to-face university courses as a new form of blended learning (de Moura et al., 2019; Zhang et al., 2021), there is a growing international consensus that MOOCs will eventually be integrated into the existing higher education system. Blended learning is a combination of face-to-face teaching, digital tools and learning resources in order to provide an optimal learning experience. The use of learning tools can occur before, during or after a learning session (e.g. in a classroom or at a university). They can support different pedagogical purposes (Platonova et al., 2022).

Hew and Cheung (2014) summarise four reasons why learners enrol in a MOOC: To learn about a specific topic, to experience a complete online course with thousands of other people, for the personal challenge, and for the motivation to get as many courses certificates as possible in a short time. Frequently, MOOC participants register mainly out of personal interest, due to the relevance of the topic to their work, for future career development opportunities, out of curiosity, to acquire the learning material, and to obtain the corresponding certificate (Liu, Kang & McKelroy, 2015). MOOCs are often discussed as an effective tool for scaling up the delivery of education and training without traditional constraints, preparing adults for work, or developing citizens' skills to remain employable and responsive to the changing needs of society and the economy. Consequently, many HEIs worldwide now offer MOOCs as short, flexible, non-degree lifelong learning opportunities, often linked to career development (Castaño-Muñoz & Rodrigues, 2021). The integration of MOOCs into professional development is the most promising future use of these educational media, according to the Organisation for Economic Co-operation and Development (OECD, 2016).

For this reason, MOOC learning is gradually being transformed as an alternative or a complement to traditional options, as an effective means of providing equal access to lifelong learning opportunities for all (Castaño-Muñoz & Rodrigues, 2021). Finally, although MOOCs have attracted people living in developed countries, they offer opportunities for learning in developing countries, remote areas, or areas with limited resources and infrastructure. For example, MOOCs covering a range of educational fields, such as engineering, IT, and social sciences, are currently being used in refugee camps in Jordan, Kenya, Lebanon and Turkey. However, other researchers question the scale, sustainability and impact of many of these MOOC-based educational programmes, given resource constraints such as internet connectivity, infrastructure and learning equipment (e.g. computers), digital illiteracy and the permanent social insecurity experienced by disadvantaged populations (Bolon et al., 2020).

3.2 Historical review

David Cormier, a professor at the University of Prince Edward Island (UPEI), first used MOOC in Canada in 2008. In September 2008, the University of Manitoba, Canada, hosted a course called "Connectivism and Connective Knowledge" by Stephen Downes and George Siemens (Zhang et al., 2010). The course was presented to twenty-five students who paid a fee and 2,300 students from the general public who took the course online free of charge. However, an artificial intelligence course - the first MOOC - offered by two professors from Stanford University (based in California, USA) in 2011 brought the term MOOC to significant popularity. Peter Norvig and Sebastian Thrun created a website which offered free access to their course 'Introduction to Artificial Intelligence' (De Notaris et al., 2021). Short videos, quizzes and online discussion forums were included in the course. This first MOOC was an unprecedented success, with more than 160,000 registered students from 190 countries worldwide, of whom 23,000 received a certificate of completion (Impey & Formanek, 2021).

To build on this success, Sebastian Thrun founded Udacity, a platform that hosts other MOOCs. The New York Times declared 2012 "the year of MOOCs" (Sun, Guo & Zhao, 2020), following the development and success of two other MOOC platforms, edX and Coursera. As early as 2013 (Billington & Fronmueller, 2013), some pundits were already calling MOOCs a bubble that would soon burst. Contrary to these claims, the expansion of MOOCs has been impressive: In the first three years of their existence, between 2012 and 2015, more than 25 million people worldwide enrolled in MOOCs. In 2014, Georgia Tech University in the United States of America (US) and the Udacity platform offered the first online master's degree in computer science based on the MOOC model. The degree was designed to be equivalent to the corresponding in-life programme but was offered at one-sixth the cost of a traditional course (Littenberg et al., 2020). Goodman, Melkers and Pallais (2016), in a related study, found that MOOC C increased enrolment among older students who would otherwise be unlikely to enrol in graduate computer science programmes, supporting the belief that MOOC-type courses aim to provide online education to an increasingly large and heterogeneous audience: adults, students,

or professionals who want to acquire or develop their skills to meet labour market needs better (De Notaries et al., 2021). 2020 will be a remarkable year for MOOCs, with one-third of users registering on a MOOC platform for the first time. For example, within a month of the initial suspension of Life Courses due to the COVID-19 pandemic until 15 April 2020, 1.5 million people signed up for Yale University's course 'The Science of Well-Being' in the US (Ofgang, 2020). All major MOOC providers (Shah, Pickard & Ma, 2022) have increased traffic by more than 50%. Figure 3 reflects the explosive growth in enrolments associated with the COVID-19 pandemic.

In some cases, enrolments were three or four times higher than in the corresponding periods of the previous year (see Figure 3). There are two reasons for this unprecedented increase in the number of registrations. On the one hand, the increased interest in online learning, linked to its massive use during the COVID-19 crisis, and on the other hand, in response to the increased need for upgrading and retraining of the workforce in the difficult economic situation and the consequent crisis in the labour market caused by COVID -19 (Castaño, Muñoz & Rodrigues, 2021).

Source: Class Central https://www.classcentral.com/report/mooc-stats-2021
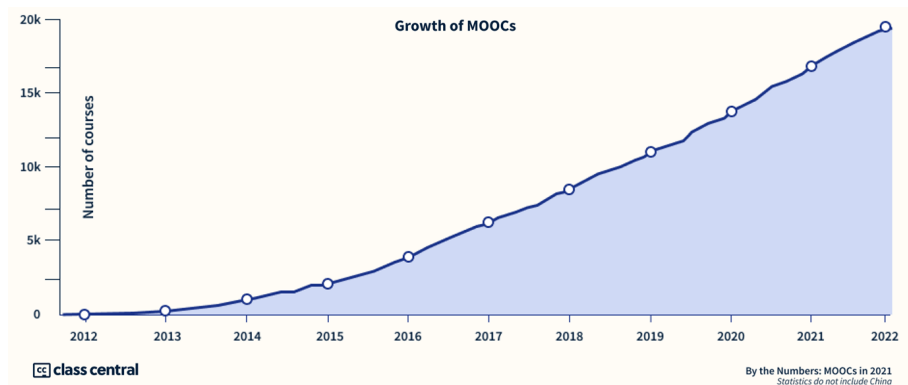
Figure 3   2012-2021 MOOC growth

3.3   MOOC providers

MOOC providers have sought to capitalise on this dynamic by expanding their courses (Gomez et al., 2022). The English-language MOOC providers are now being joined by several regional MOOC providers that have emerged in recent years, focusing on developing learning materials tailored to the needs of 'local' users regarding language and content. Examples include the Latin American provider MiriadaX, the Chinese XuentangX, and the Italian Federica.EU, the German OpenHPI, etc. The most important of these, in terms of the number of enrolled students, are Coursera (Stanford University), edXTM (MIT and Harvard), UdacityTM (Stanford University) and FutureLearn (Open University) (De Notaris et al., 2021; Li et al., 2022). Several regional MOOC initiatives use the Open edX standard - the open source initiative of edX - as the software for implementing MOOCs (Ruipérez-Valiente et al., 2020). Ruipérez-Valiente et al. (2022) rank MOOC providers at the global, regional and local levels in terms of the scope of the courses they offer:

- Global reach: Providers such as MITx, HarvardX, FutureLearn, CU Boulder, openSAP, and OpenWHO offer courses primarily in English to a global and international audience.

- Mixed reach: Providers that offer courses in the local language and English. They, therefore, have a regional focus. They allow learners from all over the world to take some of their courses. The courses can be hosted on their platform or in partnership with a global platform like edX or Coursera.

- Regional reach: Providers who operate their MOOC platform offer courses primarily in a national language. They focus on a national, regional or local population. This category includes providers such as UPVx, Edraak and XuetangX.

Coursera, edX and FutureLearn (Shah et al., 2022) are the three largest MOOC platforms with global reach:

- Coursera: Coursera Inc. was founded in 2012 by Stanford University computer science professors Andrew Ng and Daphne Koller, Coursera Inc. is a US-based provider of massive open online courses. It offers 5400 MOOCs in partnership with more than 275 universities and companies worldwide.

- edX: MITx and HarvardX (MITxHx) are the initial partners in the edX consortium. Most of their course offerings are in English and are available globally.

- FutureLearn: Founded by the Open University of the United Kingdom, with more than 170 partner institutions worldwide to deliver MOOCs, micro-credentials and degrees. Teaching is mainly in English. According to the European Commission, micro-credentials attest to short-term learning outcomes, such as short courses or apprenticeships (European Commission, 2022).

However, an attempt to categorise the most popular MOOC platforms by geographical region was made by the same researchers (Shah et al., 2022).

Table 1   The most popular MOOC platforms by geographical region

North America & United States	Europe & United Kingdom	Asia (Except China)	China
Coursera / United States	FutureLearn / United Kingdom	SWAYAM / India	XuetangX / China
edX / United States	France Université Numérique (FUN) / France	NPTEL / India	Chinese University MOOC / China
Udacity / United States	Miríadax / Spain	JMOOC / Japan	Zhihuishu / China
Canvas Network/ United States	EduOpen / Italy	Gacco / Japan	CNMOOC / China
Kadenze / United States	Federica Web Learning / Italy	Fisdom / Japan	Xue Yin Online / China
Stanford Lagunita / United States	European Multiple MOOC Aggregator (EMMA) / Europe	OpenLearning / Japan	Open Education (openedu.tw) / Taiwan
Complexity Explorer / United States	OpenHPI / Germany	K-MOOC / Korea	eWant — education you want / Taiwan
MéxicoX / Mexico	MOOC.fi / Finland	ThaiMOOC / Thailand	
	Prometheus / Ukraine	IndonesiaX / Indonesia	
	Open Education (openedu.ru) / Russia	Edraak (Arabic) / Jordan	
		Campus-Il / Israel	

3.4   MOOCs: challenges and opportunities

International research recognises the potential of MOOCs to deliver high-quality education more than a decade after their arrival on the international educational landscape and their subsequent pedagogical use as a source of new approaches to teaching. For example, it has been reported that MOOCs can create opportunities for access to quality higher education by creating learning communities on a global scale while at the same time significantly reducing tuition costs. Overall, MOOCs as a philosophy is based on an interconnected relationship between social capital and adult education (human capital) and seeks to bridge educational and economic inequality by providing knowledge and skills to groups of people in both developed and developing countries who, for various reasons (economic, professional, social), wish to acquire a high level of higher education knowledge at no or minimal cost compared to traditional study programmes. MOOCs also have the potential to be used in corporate education due to the strong demand for new knowledge and modern, new types of skills and occupations (Dodson et al., 2015). They offer a means of addressing structural inequality, as the logic of the educational systems of the previous industrial revolution (first education, then work) can no longer meet the needs of workers and companies. This perspective is based on the assumption that educational content and digital technologies can be delivered directly to learners without requiring a 'teacher' in the classroom to adapt the material to each local context and the different levels of prior knowledge and resources of the users (Pollack Ichou, 2018).

At a research level, MOOCs have enabled universities to understand better how students learn and how technology-enhanced education can be improved within and beyond traditional reading and listening rooms. For example, MOOCs support the theory of social constructivism. They allow group interaction, collaborative work, discussion and collective knowledge building. It is unsurprising to find several researchers investigating how to collaborate in MOOCs using communication tools such as user forums. Collaboration can also occur through different learner activities, such as commenting on activities, sharing resources or joint projects, etc. Thus, learning can occur through spontaneous interactions among students rather than through interaction with the content (Ruipérez-Valiente et al., 2021; de Moura et al., 2021).

However, several studies have highlighted the challenges and problems associated with using MOOCs and the expectations of using MOOCs to improve the educational process. One of the main problems is the high dropout rate of learners: A small percentage of the large number of participants who enrol in MOOCs manage to complete the course compared to traditional courses (De Notaries et al., 2021). It has been reported (Borrella et al., 2022) that the completion rate for MOOCs is less than 10% or even 5%. For instance, a study by Duke researchers (Goldwasser et al., 2016) on user behaviour for college classes on Coursera's platform shows

a similar pattern. 65% visited the course website. 41% watched a video, and 11% watched a forum. The engagement rates in the learning process were even lower for students: 21% completed at least one graded assignment, 5% wrote a forum post, and only 2% received a certificate. Jordan (Jordan, 2015) analysed 221 MOOCs worldwide and found that the average user completion rate varied between 0.7% and 52.1%, with the average being 12.6%. De Notaries et al. (2021) interpret the high dropout rate as a result of the openness of MOOCs and their free nature (or, in a few cases, the low cost of enrolling in a course).

In the MOOC literature, there is no official international definition of dropout. In various international studies, 'dropouts' are learners who take part in a course but leave it without taking the final exam or without obtaining the relevant certificate (Breslow et al., 2013). The factors behind MOOC attrition have been the subject of much research in the literature (Borrella et al., 2022). MOOC attrition factors can be classified into three categories: student-related factors (personal), course-related factors (institutional), and environmental factors (external), according to Lee and Choi (2011). Personal factors refer to the characteristics and abilities of a student prior to his or her enrolment in the course. Institutional factors refer to factors specific to the course. External factors are not directly related to the learner and the course. However, they may influence the decision to drop out (Borrella et al., 2022). Personal factors include the demographics of the learner, individual characteristics and the academic background of the learner.

On the other hand, determination, self-efficacy, motivation, curiosity and ability to manage time significantly influence completing MOOCs. Other studies (Borrella et al., 2022) have identified academic background and related skills, such as digital literacy, as equally important. The pedagogical approach largely determines institutional factors. Five pedagogical approaches in MOOCs - associative, cognitive, constructivist, adaptive and connective - are identified by Conole (2015). Each approach focuses on a different way of learning: individually and experientially, building on prior knowledge through dialogue and a community of peers, respectively. The chosen pedagogical approach largely determines the elements of the course design, i.e. learning style and content format, type and typology of activities, media and resources, level of interactivity and assessment (Borrella et al., 2022; Campos et al., 2022; de Barba et al., 2020; Littenberg-Tobias & Reich, 2020; Xiao et al., 2019; Padilha et al., 2021; Sun et al., 2020).

In theory, regardless of race, age, education, income or geographical distribution, MOOCs as learning content are open to all. However, there needs to be more evidence to suggest that MOOCs are reaching the disadvantaged and socially excluded groups that benefit most from them (Pollack Ichou, 2018) beyond anecdotal success stories (The Economist, 2013). Age, gender, education, income, access, and learners' digital skills and experience contribute to internet skills and use differences. The financial factor must also be taken seriously. MOOCs have become highly commercialised in recent years. There is a wide range of free offerings from prestigious universities, and most MOOCs are free. However, large platforms such as Coursera are for-profit companies in the education sector. In 2014, for example, Coursera earned US$1 million a month from certification fees. It reduced the number of programmes with the

option to obtain a "verified certificate" (Shah, 2014).

Furthermore, this may change, even though most MOOCs do not charge for their use. The ability of universities to continue creating and making MOOCs freely available is questionable, given the significant financial and human resources required to produce them. Even elite, not-for-profit universities may be tempted to have a financial return on their investment to maintain the quality of the educational content.

Unfortunately, the second wave of MOOCs (MOOCs 2.0) will likely exclude more students without the necessary income and skills due to the costs of creating, managing and maintaining them. MOOC 2.0 supports traditional higher education students, not those excluded from studying (Naidu, 2020). MOOC 2.0 resembles mainstream e-learning delivery models focusing on typical learners, more effective integration into established distance learning programmes, and credible credentials (Soylev, 2017). Several researchers argue that such a shift contributes to the digital divide. The gap between the haves and have-nots (Lambert, 2020) is widening rather than narrowing.

3.5   Typology of MOOCs and their pedagogical approach

MOOCs generally fall into four categories: (1) stand-alone courses, which are primarily intended for learners who take them for personal development; (2) courses, which are a set of courses related to a subject of study offered by a traditional educational institution, and which may lead to the acquisition of a certificate or credits; and (3) university MOOCs, which are an entire course of study, delivered online, and those who complete it are awarded the same accredited degree as a traditional higher education programme. (4) MOOC degrees, which refer to an entire course of study that is delivered online and those who complete it are awarded the same accredited degree that is equivalent to the formal study of a higher education programme; and (5) university MOOCs, whose lectures and assessments are conducted online in collaboration with different traditional universities (Xiao et al., 2019). Underlying these four categories of offerings are two different educational philosophies of MOOCs: cMOOCs and xMOOCs (De Notaries et al., 2021; Wei & Taecharungroj, 2022).

Connectivist MOOCs (cMOOCs) are guided by the learning theory of connectivism: the learner contributes to a learning community by learning from, connecting to and sharing information with it. cMOOCs are characterised by openness, diversity and autonomy as connected nodes share and create knowledge (Downes, 2008). The nodes, which include learners, information and data, connect the various elements of a more comprehensive network (Corbett & Spinello, 2020). Therefore, learning creates and connects disparate networks comprising knowledge domains. The development of cMOOCs explores teaching methods that use social networking technologies such as Web 2.0 (Danka, 2020). cMOOCs are not treated as content created for each course - it is content already used on the World Wide Web and open for linking. Learners (Xie & Wang, 2022) must plan how to study MOOCs. Daily newsletters can be used to curate content and send it to students. Various resources, such as blog posts or collective bookmarks, can be used to create and document the connection between learners and content. Learners can share their new connections with others (Lazarus & Suryasen, 2022) while making internal connections to the learning content. In cMOOCs, learners are co-authors of the course content. The teacher is on the same hierarchical level as the learners (Danka, 2020). Learners are invited to contribute to creating and sharing knowledge rather than emphasising instructor-generated content (Corbett & Spinello, 2020). Courses offered in this way are self-paced. This gives learners considerable autonomy in deciding the course and pace of their study. However, this characteristic requires learners to make use of multi-layered digital media and to focus on the production of learning outcomes. Due to the characteristics mentioned above, cMOOCs, despite their apparent advantages, are often unable to achieve practical and theoretical assessment and do not obtain any financial benefits (Lazarus & Suryasen, 2022).

In contrast, xMOOCs adopt a cognitive-behavioural approach to content-based knowledge, through which ready-made learning material is delivered to learners in an instructor-led manner to achieve pre-determined expected learning outcomes (Estrada-Molina & Fuentes-Cancell, 2022). The pedagogical design of xMOOCs is similar to live university lectures. The only difference is the digital content's delivery medium (Wei et al., 2021). xMOOCs have been developed by leading universities worldwide to evolve digital technology and teaching strategies in live teaching using Web 2.0 technologies (Palacios Hidalgo et al., 2020). In xMOOCs, there is an educational offer. An instructor still plays a central role in disseminating knowledge (Lazarus & Suryasen, 2022). The instructor also creates and records the class content, assigns exercises, and guides the learners in determining the learning path to be followed (Xie & Wang, 2022). Discussion among learners is encouraged. However, it is led by an instructor who assumes the role of organiser of the learning process (Wei et al., 2021). xMOOCs have surpassed cMOOCs in both number and enrolment because they are similar to the traditional approach to teaching

that most higher education institutions already use. They are being used by an increasing number of higher education institutions (Palacios Hidalgo et al., 2020) to facilitate the transition from offline to online teaching, particularly in the awarding of credits, certificates of attendance and degrees.

Over time, however, the distinction between cMOOCs and xMOOCs has become less clear-cut. For example, recent research has highlighted a variety of courses on xMOOC platforms that attempt to create an online learning community with an emphasis on developing a culture of collaboration and dialogue among learners. In addition, there is a trend for MOOC providers to move away from the support of extensive open courses and instead partner with universities to offer more conventional online degree programmes (Padilha et al., 2021). Since 2014, the development of MOOCs has entered a third phase, known as "abcMOOC". Both the content and format of MOOCs are being adopted. This phase incorporates the idea of the "flipped classroom", with the role of MOOCs changing not only as an alternative learning model associated with higher education but also as a means of providing a certificate of study comparable to traditional university education (Wei & Taecharungroj, 2022).

4   Conclusions and discussion

MOOCs have rightly been in the spotlight due to their potential and attractiveness among the various open educational resources developed over the last two decades (Castaño-Muñoz & Rodrigues, 2021). Compared to traditional live teaching, MOOCs allow everyone access to high-quality educational content without spatial and temporal limitations (Chan et al., 2019). MOOCs offer a flexible, targeted way to help people develop the knowledge, skills and competencies they need to develop, personally and professionally (European Commission, 2022).

However, MOOCs also need help to overcome significant challenges. These include high dropout rates and low levels of learner participation in various educational activities. However, criticism of MOOCs is based on comparisons with traditional forms of education. It often needs to consider the key features that set MOOCs apart. For example, the participation of students in MOOCs is often voluntary and mainly based on the learners' motivation (Fang et al., 2019). There is also considerable variability in the quality of courses (Katsaris & Vidakis, 2021), just as in a university. It must be understood that MOOCs have a corresponding variability in the quality of the content on offer (Chan et al., 2019; Deng et al., 2019; Douglas et al., 2020; Mohammed, 2022).

To conclude, more than a decade after the emergence of the first MOOC, scientific research and academic practice should focus on how to most efficiently exploit the enormous opportunities that MOOCs can offer to provide access to high-quality knowledge and education while addressing challenges such as high dropout rates and developing sustainable cost models (Aguayo et al., 2022; Zawacki-Richter et al., 2018). The design of a new generation of MOOCs should equally consider the critical lessons learned from an open, distance and flexible learning, especially in the aftermath of the recent pandemic, regarding educational community support, instructional design and quality assurance.

Conflicts of interest

The author declares that they have no conflict of interest.

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