
MOOCs in Higher Education

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<http://dx.doi.org/10.5772/66137>

Abstract

MOOCs have been the major issue in higher education worldwide since 2008. Frankly speaking, there are clear pros and cons of moving into MOOC-based education. This chapter deals with the pedagogical utilization and limitations of MOOCs in higher education. Through literature review and websites surfing related to MOOCs, expansion of MOOCs, instructional strategies in MOOCs, functions of platform for MOOCs, development of a MOOC, and future of MOOCs are summarized, analyzed, and discussed at the aspect of pedagogy. Based on the analysis, some recommendations are suggested for the success of MOOCs.

Keywords: MOOC, higher education, e-learning

1. Introduction

During last years, MOOCs, or massive open online courses, have been at a furious pace (Table 1). MOOCs are a new type of e-learning class, which are consisted of short video lectures, computer-graded tests, and online discussion forums. They are usually for free and sometimes by fee. MOOCs have been positioned as hybrids of previous attempts at online distance education opportunities, such as Open Coursewares (OCWs) and Open Educational Resources (OERs) [1]. However, in spite of widespread adoption, the instructional quality and business model of MOOCs are still under the question. Need of adequate instruction and business strategies for utilizing and operating MOOCs in higher education has been highly required.

This chapter summarizes the present status of MOOCs in higher education, theoretical frameworks underpinning the pedagogical approach instantiated in MOOCs, and education research contributing to the design, implementation, analysis, evaluation of MOOCs and to suggest implications and strategies for operating MOOCs.

USA	Europe	Asia-Oceania
Coursera (2012): 1905 courses	FutureLearn (2012, UK): 351 courses	KMOOC (2014, Korea): 18 courses
edX (2012): 975 courses	Open Classrooms (2007, France): 25 courses	JMOOC (2013, Japan)
Udacity (2012): 141 courses	OpenHPI (2012, France): 30 courses	Xuetang (China)
Peer to Peer Univ. (2009)	iversity (2013, Germany): 93 courses	NPTEL (2006, India): 96 courses
NovoEd (2013): 77 courses	ALISON (2007, Ireland)	OpenLearning (2012, Austria)
Canvas: 345 courses	MiriadaX (Spain): 168 courses	Rwaq (2013, Saudi Arabia)

Table 1. Main MOOCs in the world (2016).

2. Big-bang expansion of MOOCs

MOOCs for higher education have rapidly expanded in the USA, Europe, Asia-Oceania, etc., since 2008: Coursera and edX in the USA, FutureLearn (UK), iversity (Germany), MiriadaX (Spain) in Europe, KMOOC (Korea), and OpenLearning (Australia) in Asia-Oceania.

The number of students who have signed up for at least one course surpassed 35 million in 2015, which is higher than an estimated 16–18 million from the previous year [2]. In 2015 (**Table 2**), Coursera accounted for nearly half of all MOOC students (17 million) and 35.6% of MOOC courses. edX is the second-ranked provider with just over 18% of all courses. Canvas network comes in third with 6.92% of courses, followed closely by FutureLearn at 5.68%. FutureLearn, which is grown by 275% with an estimated user base of 3 million, is now the third-ranked provider by enrolment. The percentage of courses in English decreased slightly from 80% in 2014 to 75% in 2015. It is caused by the growth of France Université Numerique (FUN) and the Spanish platform Miriada X.

2.1. What brings the very fever of MOOCs?

First of all, MOOCs promise to provide free education, unlimited participation, and open access for anyone. That is, they aim at democratization of education. The registered learners, who appear to be broad, diverse, and nontraditional, can get the free opportunity of participating in the lectures which famous professors in top universities give online. Supporters

MOOC service	Coursera	edX	Canvas	FutureLearn	Miriada	France Université Numerique
Market share	35.6%	18.1%	6.92%	5.68%	3.66%	3.33%
MOOC service	Udacity	Open Education	Rwaq	Diversity	NovoEd	Others
Market share	2.95%	2.12%	1.83%	1.78%	1.63%	16.4%

Source: Class Central.

Table 2. Provider market share by courses offered (2015).

of MOOCs consider them as a means of democratizing access to education and as promising new insights into teaching and learning from analytics on tens of thousands to millions of students [3, 4]. Many people are sure that MOOCs will reduce the costs of teaching and they are efficient from an economic perspective. Second, many universities in the world scrambled to join in the new movement of MOOC. They did not want themselves to be left behind, compared with other top-leading universities. And governments from many countries are eager to participate in the paradigm shift of MOOC. For example, French government and Korean government have, respectively, backed France Université Numerique and K-MOOC.

2.2. What is the business model of MOOCs?

At this time, no convincing business models exist [5]. The sustainable business model has been a major challenge for MOOC providers. The envisioned premium services generating income may include learner's pay for certificate and secure assessments, company's pay for applicant screening and employee recruitment, learner's pay for human tutoring or assignment marking and tutors supporting forums to operate more successfully, hotline services to support learners experiencing problem with content and technical issues, selling MOOC platforms, sponsorships, tuition fees (e.g., the experiment of computer science dept.) [6].

The industry has an unusual structure, consisting of linked groups including MOOC providers, the larger nonprofit sector (e.g., the Bill & Melinda Gates Foundation, the MacArthur Foundation, the National Science Foundation, and the American Council on Education), universities, related companies and venture capitalists (e.g., Kleiner Perkins Caufield & Byers, New Enterprise Associates and Andreessen Horowitz).

In 2015, major MOOC providers are stepping back from offering free certificates in favor of paid credentials and courses for credit [2]. A number of examples of alternative credentials (e.g., edX's XSeries program, Coursera's specializations, and Udacity's Nanodegrees) appear.

The major MOOC providers are increasingly focused on fee-based credentials, including alternative credentials but also more traditional academic credit options and full degrees, as the foundation of their revenue models.

2.3. Are MOOCs reliable?

MOOCs have generated underestimation and skepticism as well as hype worldwide. The main concerns about MOOCs are as follows [5, 7]: the absence of serious pedagogy, homogenization and depersonalization of education, corporate influences on the academy and lack of attention to the findings from decades of research on distance education. In particular, the issues of instructional design quality including learner motivation and support are considered very serious, which are the main reason of low rate of completion in courses. One study summarized the most commonly cited reasons [8]: MOOC takes too much time, assumes too much knowledge, is too basic and not really at the level of world leading universities, provides lecture fatigue, poor course design, clunky communication tools, bad

peer review, and hidden costs (e.g., professor's expensive textbook, paying for a feature designed to prevent cheating on exams). Learners in a MOOC can be degraded to the shopper for courses.

Professor's burden in teaching should be also treated at the same level with the above problems. The most frequently cited reason for professors' participating in MOOCs is a desire to increase access to higher education worldwide. But the big instructional burden which the professors must take for lecture preparation is beyond that in face-to-face class. A lecturer spent more than 100 hours on recording online lecture videos and doing other preparation before starting MOOC class and he or she spent 8–10 hours a week on the course including online activities such as discussion forums [9, 10].

Up to now, most of analyses on MOOCs focused on economy (e.g., productivity, cost) and technology (e.g., platforms, automatic grading). More theoretical groundings and qualitative and quantitative data are still requested for evaluating whether MOOCs are effectiveness and efficiency in educational perspective.

3. Instructional strategies in MOOCs

Do MOOCs play a pedagogical role well? Why is this question important? Because educational quality can ensure the success of MOOCs. MOOCs are at a retrograde step, because it is as if distance learning had just been invented and nothing was known about the need for quality in instructional design and learner support [11]. High noncompletion rates are related to the issues of quality, sustainability, and pedagogy. Most registered students are shopping around MOOCs. They intend to explore the topic rather than complete the course. Siemens [12] suggested that the whole idea of an educational course needs to be reconceived from the traditional, closed group, highly structured course, where students are dependent on tutors, to open networks of self-directed learners.

In this section, some suggestions on instructional strategies in MOOCs are provided in order to solve the problem of low completion rates, usually lower than 10%.

3.1. Customizing a MOOC for satisfying learner's need

As MOOCs have evolved, two distinct types of MOOCs appeared: cMOOC or connectivist MOOC (e.g., P2PU, Udacity, Open Learning), xMOOC or eXtended MOOC (e.g., Coursera, edX). cMOOCs are based on principles of connectivist pedagogy or the theory of connectivism, which argues that learning processes need to be carried out within communities and networks of learners in order to increase their knowledge by making connections and interacting with the knowledge community [13]. Instructional design approaches in cMOOCs attempt to connect learners to each other to answer questions and/or collaborate on joint projects. cMOOCs support collaborative dialogue and knowledge building [14]. Learners are increasingly exercising autonomy regarding where, when, how, what, and with whom to learn. To do this, they often select technologies independent of those offered by traditional courses. Utilizing blogs in cMOOCs can give students a "social presence" [15], and can be a medium for connection, self-expression, self-indulgence, and rich and critical distribution

of information [16]. Five possible challenges can be suggested for cMOOCs [10, 17]: user-created content may make learning environment chaotic; digital literacy is required to utilize the online materials; the time and effort are needed from participants; once the course starts, students reshape and reinterpret, so that instructors have the difficulty of controlling the course trajectory; participants must regulate their own study plans and contents and set their own goals. The course will take on its own trajectory.

xMOOCs, the content-based or professor centric MOOCs, “reflect a more traditional learning approach of knowledge duplication through video presentations and short quizzes and tests” [18]. They employ elements of the original MOOC, but are, in effect, branded IT platforms that offer content distribution partnerships to institutions [19]. The instructor is the expert provider of knowledge, and student interactions are usually limited to asking [10]. More recently, it has been suggested that the distinction between these MOOC variants has become increasingly blurred such that “what goes on in any given MOOC is no longer clearly determined by its ‘x’ or ‘c’ status” [20]. And there have been calls to abandon the MOOC acronym in favor of new titles that more accurately capture the particular design and purposes of specific courses: hMOOC (hybrid MOOC), MOOR (Massive Open Online Research), MOOL (Massive Open Online Lab), DOOC (Distributed Open Collaborative Courses), POOC (Participatory Open Online Courses), and SPOC (Small Private Online Courses) [21]. Up to now, most of MOOCs are a type of xMOOC. Instructional activities in MOOCs need to be varied for satisfying learner’s need.

3.2. Motivating learners

Less than 10% of the students who sign up typically complete the course. Most participants participate peripherally. Some students did not care whether they could complete a course or receive a certificate. Instead, they wanted to learn something based on specific needs. The most basic solution to the problem of poor completion rates is to motivate the learners to participate in the activities of MOOCs. Clow’s model [22] is useful for motivating MOOC’s learners. He creates the funnel of participation metaphor to describe the activity and completion rates in MOOCs. This funnel is defined as awareness-registration-activity-progress and is characterized by being similar to the AIDA (awareness, interest, desire, action) marketing funnel where attrition occurs through the stages of product awareness, interest, desire, and action. Howarth and his colleagues [23] extended Clow’s model [22] by adding “student completion” to the end of the funnel (**Figure 1**).

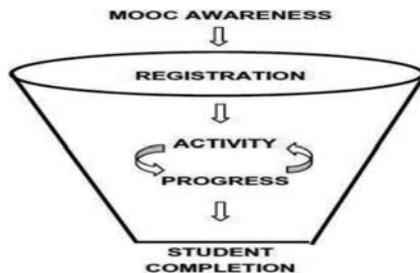


Figure 1. Funnel of participation. Source: Howarth and his colleagues [23].

To achieve registrations, awareness (attention) of their product should be created first through interest. Simply put, MOOCs should be perceived as being better than the tool or practice it replaces. Rogers [24] identified six relative advantages: economic profitability, low initial cost, decreased discomfort, social prestige, saving in time and effort, and immediacy of reward. The absence of cost is cited as a major reason for MOOC enrolment [22]. Value judgments on the basis of low price are clearly a motivator.

3.3. Identifying the factors for adoption of MOOCs

What are the main factors which affect the adoption of MOOCs? For identifying them, studies about factors that determine persistence in and dropping out of distance education will be helpful. The findings of Kim and Park [25] classified the factors into four categories: learner's characteristics, goal commitment, academic environment, and social environment on the basis of Kember's model of dropouts from distance education. Rogers [24] classified variables determining the rate of adoption into five attributes: perceived attributes of innovations, type of innovation-decision, communication channel, nature of the social system, and extent of change agents' promotion.

Al-Raimi [26] found that the intention to continue using MOOCs is significantly influenced by perceived reputation, perceived openness, perceived usefulness, perceived, and user satisfaction and "perceived reputation" and "perceived openness" were the strongest predictors. The cost of "free" may be too high in online education because it is threats to the economics of tuition-dependent educational institutions.

4. Functions of Platform for MOOCs

Once we decide to start some courses and consider a MOOC. Which tool will you use to operate the course? Swope [27] analyzed the main functional difference among five main MOOCs (Table 3).

A MOOC platform is first and foremost a branded website promoting courses based on a common learning management system (LMS). A MOOC is different from existing e-learning course in that it is characterized as open environment, free access, unlimited group, and emphasis on the learning process. So a MOOC platform must be different from the existing e-learning platform, or LMS and LCMS. What do most MOOC platforms have in common? They have common functions of technical hosting and publicity. Course developers utilize MOOC platforms in order to operate their content and learning environments including forums, quizzes, exams, peer to peer assessment, etc., and MOOC platforms also contribute to the visibility of the courses on their site [28].

First of all, let us see the open edX platform which powers edx.org and many other online education sites. This platform contains the learning management system (LMS), course authoring applications, course discussion, mobile apps, and analytics (Figure 2).

The LMS uses an application programming interface (API) provided by the comments service to integrate disc. The Open edX provides a mobile application for iOS and Android and its analytics capture events describing learn behavior. The events are stored as JSON in S3,

	Max. class size	Brandable	Custom analytics	Monetization	Mobile	Hosting
edX	300,000	○	○	○	○	Self-hosted
Moodle	10,000	○	○	○	○	Self-hosted or 3rd party
COURSEsites	Unlimited	X	○	X	○	Hosted
Udemy	Unlimited	X	X	○	○	Hosted
Versal	Unlimited	X	X	X	○	Hosted

Source: Swope [27].

Table 3. Comparison of main MOOC platforms.

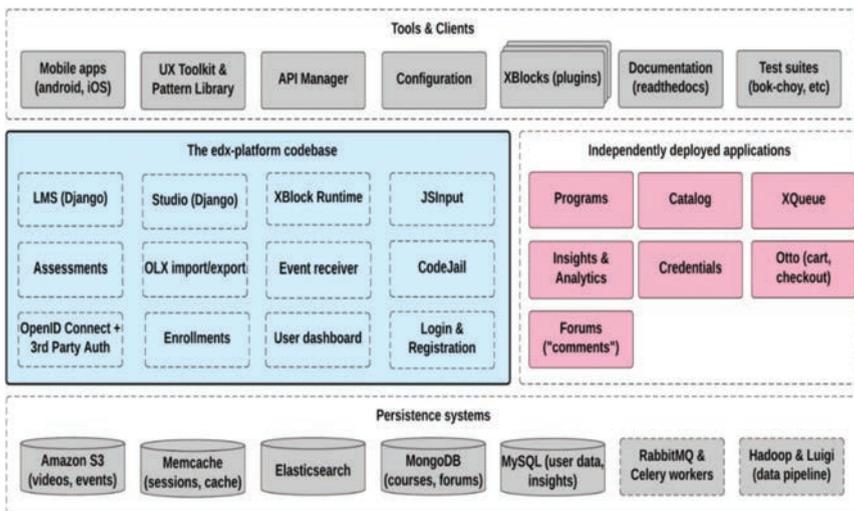


Figure 2. Open edX architecture. Source: <https://edx.readthedocs.io/projects/edx-developer-guide/en/latest/architecture.html>.

processed using Hadoop, and then digested, aggregated results are published to MySQL (Figure 3). The service is supported by a collection of other autonomous web services called IDAs (independently deployed applications). Almost all of the server-side code in the Open edX project is in Python, with Django as the web application framework.

Let us see another example, the Korea-MOOC (K-MOOC) service. In 2015, Korean government launched the massive open online courses with 10 top leading universities in Korea. K-MOOC also utilizes an open source (Open edX) for developing the MOOC platform. K-MOOC service is composed of opening lectures, course registration & personal identification, on & offline learning, evaluation, sharing learning outcomes & utilization process, and performance procedures [29]. The K-MOOC platform includes LMS, LCMS, authoring system, smart device support system, integrated search system, user management system, operation & management system, and learning outcome management system (Figure 4).

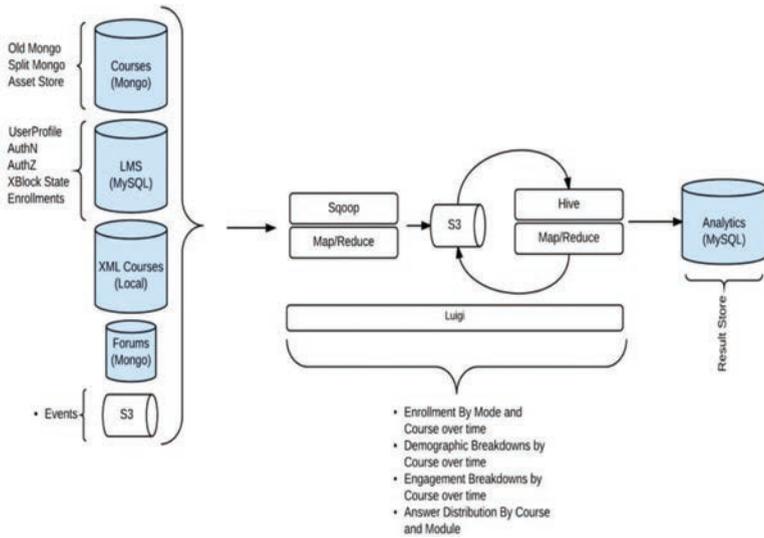


Figure 3. Open edX analytics pipeline architecture. Source: <https://edx.readthedocs.io/projects/edx-developer-guide/en/latest/architecture.html>.

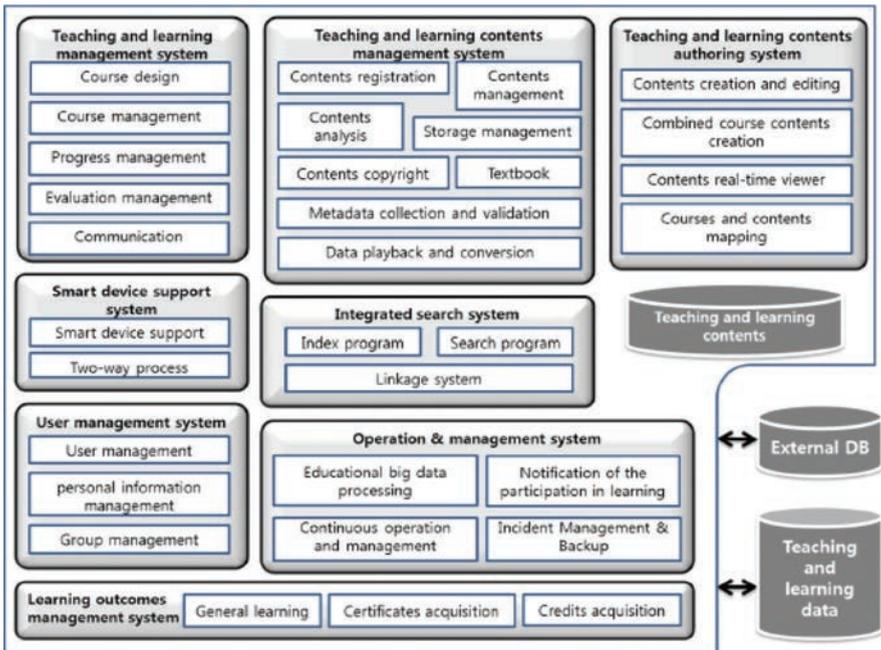


Figure 4. Configuration of K-MOOC. Source: Kim [29].

5. Development of a MOOC

Now let us think how to develop a MOOC. The first thing to do is choose what to teach. Existing online courses can be converted into a MOOC and new subject can be a MOOC. If there are existing video clips, time and cost can be saved. It is important to choose key MOOC activities (aggregation, remixing, repurposing, feeding forward) at the aspect of pedagogy [30]. The activity of “aggregation” (e.g., filtering, selecting, gathering personally meaningful information) will be performed through lecture notes, presentation slides, and case studies. “Remixing” (e.g., interpreting the aggregated information and bringing it to personal perspectives and insights) will be facilitated through online quizzes and assessments. “Repurposing” (e.g., refashioning the information to suit personal purposes) will be promoted through interactive assessments, mock-up apps, and peer & self-assessment. Assessment can be the most difficult activity to conduct online. Special attention should be devoted to proctoring and cheating. The “feeding forward” activity (e.g., sharing the newly fashioned information with and learning from other participants) will be performed through collaboration mechanism and features (i.e., discussion forum, twitter, blog, wiki).



Figure 5. Phase 1: Planning the course.

For an example of developing a MOOC, Udemy, which provides a MOOC platform for free, can be suggested for introducing how to create a MOOC. Udemy is an instructor-directed MOOC platform, not a university or private platform provider. The process consists of four steps: plan the course, create the relevant content, publish the completed course, and promote the course through various channels. At the first step of planning the course, an instructor visits and joins Udemy (Figure 5). He or she must be well acquainted with Udemy’s guidelines for developing a MOOC. Second, the instructor must set the course’s learning objective & audience and outline a curriculum (Figure 6). Also, prior considerations should be taken



Figure 6. Phase 2: Creating the relevant content.

about course duration, content structure, learning activities, globality of learners, etc. A good way to decide on the content or topics is as follows [31]:

Make a list of the possible topics that could be derived from the general and specific objectives.

Choose the essential topics that are directly related to the objectives.

Note the topics that appear at the top of the list once the essential items have been removed. Third, an instructor must create a test video and get feedback on his or her video production from our review team before recording your entire course (Figure 7). And the instructor uploads materials to lectures.

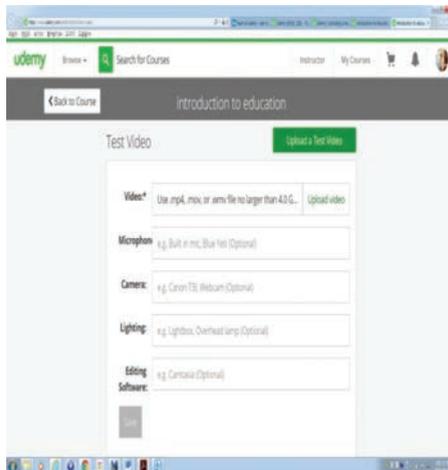


Figure 7. Phase 3: Publishing the course.



Figure 8. Phase 4: Promoting the course.

Fourth, promoting the course follows (Figure 8). An instructor should refine the course title and subtitle. He or she must make the course look professional with goals, objectives, a summary, and his/her instructor bio.

6. Future of MOOCs

MOOCs are state of art. But the high technology cannot ensure the quality and success of MOOCs. Does a MOOC-based program lead to a degree from an accredited institution? It may not be easy. Although MOOCs have the strength of free courses, free courses are far from a degree from an accredited university. Because learners must pay for the degrees. It explains that MOOCs are situated with being self-contradicting between access and cost. There is no such thing as a free lunch. Although there have been lots of other forms of open educational resources (OERs) or Open Coursewares (OCWs) in the world, nobody is sure whether this movement has been successful in improving the access opportunity toward higher education or not. It is near a myth that the MOOC-based program will not only democratize higher education but also end the unsustainable trajectory of tuition. The strongest disruptor is the selfishness of traditional higher education institutes. It just seems that MOOCs threaten so-called "brick-and-mortar" institutions. In fact, the traditional higher education institutes hold the initiative of the MOOC-based program. And learners also have been interested in MOOCs from traditional universities rather than only MOOC-based institutes, especially for a degree. The universities offering MOOCs were generally not willing to provide their own academic credit for the courses: citing residency requirements, they claimed to be protecting the integrity of the residential-campus experience [32]. Accordingly, MOOCs may remain be "tsunami" of a teacup.

MOOCs may bring not only affirmative sides including autonomy, diversity, openness, and connectedness/interactivity through online courses, but also negative aspects such as limitation of the learning potential caused by the lack of structure, support, and moderation normally associated with an online course [33]. High noncompletion rates are related to the issues of quality, sustainability, and pedagogy: "Although improving the quality of learner's learning is one of the priorities of the major MOOC providers, most of their courses currently lack a sophisticated learning architecture that effectively adapts to the individuals needs of each learner [34]."

Based on the facts mentioned above, several recommendations can be suggested for the success of MOOCs. First, a combination of xMOOC and cMOOC is needed for pedagogical aspects as well as reuse, revision, remix, and redistribution of courses. As alternatives to MOOCs, hMOOC, MOOR, MOOL, DOOC, POOC, and SPOC can be suggested [21]. Second, instructional strategies should be transplanted into the course in order for learners to perform autonomous self-study and reflection upon interaction with other participants in an open social context [30]. Third, strategic communication system (e.g., regular messages) should be provided. It will assist to maintain the engagement and focus of learners on the course experience and to enhance the perception of "teaching presence" by learners [30]. Vardi [7] pointed out an "absence of serious pedagogy in MOOCs" and criticized the format of "short, unsophisticated video chunks, interleaved with online quizzes, and accompanied by social networking."

MOOCs have the potential to enable free university-level education on an enormous scale. A concern about MOOCs is also very big. Compared with the fast expansion of MOOCs through utilizing well-packaged course materials, instructional design quality in majority of MOOCs scored low [35]. Fischer [5] said, "whether or not a particular learning environment (e.g. a specific MOOC course or MOOC platform) succeeds depends greatly on whether students can learn what they want and when they want it, freed from the restrictions of curriculum consisting of desirable and undesirable content that has been segmented into majors and degree programs." MOOCs can win success when they stick to the first great cause of free-paying university and make an effort to be pedagogically driven rather than technologically in teaching and learning design.

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