

# Multi-Layer Analysis Regarding Massive Online Open Courses Attractiveness Towards Academic Environment

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## Abstract

Starting 2008 there was developed a new concept regarding eLearning – Massive Online Open Courses (MOOC). Its rapid growth is also reflected within research and development activities. In the current paper, we have attempted to analyze this academic interest between 2008 and 2016. A number of 3264 articles were collected from ISI Web of Science. The authors assess the attractiveness of MOOCs as academic topic of discussion in terms of most cited papers, most cited authors, the co-citation networks (papers and countries). We applied bibliometric methods on collected publications by using CiteSpace as tool for analyzing and visualizing the results.

**Keywords:** bibliometric research, CiteSpace, eLearning, MOOC

## 1. Introduction

Nowadays MOOC platforms embed various content that can be used to obtain ECTS in prestigious universities, for personal development (Bucovetchi et al., 2015), or in entrepreneurship (Holotescu, C. et al., 2017). MOOC provides a virtual space to self-paced and active learning which offer the participants the chance to take part into global learning communities (Bogdan, R., 2017).

The main objective of this paper is to analyze if the academic interest towards eLearning and MOOC increased in the same manner as the interest of users regarding MOOCs.

The starting point of the analysis was the assessment of the evolution of MOOC platforms attractiveness 2014-2017 (see Table 1). The criteria taken into consideration when assessing the attractiveness were site value and the daily unique visitors of Coursera, EdX, Udacity and Udemy.

*Table 1. Evolution of MOOC platform attractiveness*  
[source: Bucovetchi et al., 2015 and [www.siteprice.org](http://www.siteprice.org)]

Platform	Coursera		EdX		Udacity		Udemy	
	2014	2017	2014	2017	2014	2017	2014	2017
site value (\$)	6,216,699	4,533,552	2,378,607	3,332,245	1,621,500	2,129,558	8,323,318	8,879,258
daily unique visitors	553,301	545,000	209,667	298,983	143,084	219,990	753,214	824,853

With the exception of Coursera platform, all other MOOC increased their attractiveness as it can easily be seen. The authors consider that the involution of Coursera is generated by Coursera’s policy to introduce more and more payable services (by comparison with 2014 when all classes were free).

The main objective of this paper is to analyze if the academic interest towards MOOC as particular expression increased in the same manner as the interest of users regarding MOOCs.

## 2. Methodology

The research resulted in collecting data from Web of Science, namely research publications. As Shahiari, N. and Gheorghe, A.V., 2015 considered that publishing the results of a research is a critical part of any scientific activity, within the demarche, the authors analyzed the publications published between 2008 and 2016 that contained the items “MOOC” or “eLearning” in topic. The present paper presents the results of citation analysis used as bibliometric method. All data were analyzed using CiteSpace as software tool for a better visualization of trends. According to P. Pradhan, 2016, CiteSpace is a freely available Java application developed by Chaomei Chen in 2004 (Chen, 2004, Chen, 2016) for progressive knowledge domain visualization and analyzing trends and patterns in scientific literature. “It helps to conduct interactive visual analytic studies of scientific literature concerning a scientific field, a discipline, or an institution, and identify and interpret salient patterns and trends.

CiteSpace provides various functions to facilitate the understanding and interpretation of network patterns and historical patterns, including identifying the fast-growth topical areas, finding citation hotspots in the land of publications, decomposing a network into clusters, automatic labelling clusters with terms from citing articles, geospatial patterns of collaboration, and unique areas of international collaboration.

CiteSpace supports structural and temporal analyses of a variety of networks derived from scientific publications, including collaboration networks, author co-citation networks, and document co-citation networks”.

This research was conducted on the 18<sup>th</sup> of October 2017. We collected a number of 3264, namely 2365 proceeding papers, 766 articles, 48 editorial materials, 46 meeting abstracts, 43 book chapters, 15 reviews, 15 book reviews, 14 letters, 4 news items and 1 correction. We downloaded full record information of all 3264 publications and processed them with CiteSpace.

## 3. Results

Starting from the definition given by Clark, RC in 2016 based on what “eLearning is the instruction delivered on a digital device (such as a desktop computer, laptop computer, Tablet or smart phone)” the authors assumed that MOOC is a category of eLearning.

However, analyzing the results presented in Table 2, it came up that in academic literature only during the past 4 years the 2 elements (MOOCs and eLearning) were discussed simultaneously, yet not frequently. Top 5 of the Web of Science Categories of the analyzed scientific publications are education educational research (1,714), computer science theory methods (458), computer science information systems (446), computer science interdisciplinary applications (411), and engineering electrical electronic (363)

Table 2. The number of publications containing “MOOC” of “eLearning” in topic between 2008 and 2016  
[source: ISI Web of Science]

No.	Year	MOOC or eLearning	MOOC	eLearning
1	2008	131	2	129
2	2009	123	2	121
3	2010	250	3	247
4	2011	207	5	204
5	2012	228	5	223
6	2013	281	84	200
7	2014	481	268	224
8	2015	737	495	262
9	2016	826	591	249
TOTAL		3264	1455	1859

When drawing the chart of the 9-year evolution (see Figure 1), one may conclude that the interest for eLearning is almost constant, yet in terms of MOOCs, the attractiveness is growing year

after year. In authors’ opinion, the article published in November 2012 in New York Times<sup>3</sup> that considered 2012 – “the year of the MOOC” represents the breaking point in starting MOOCs evolution as research topic.

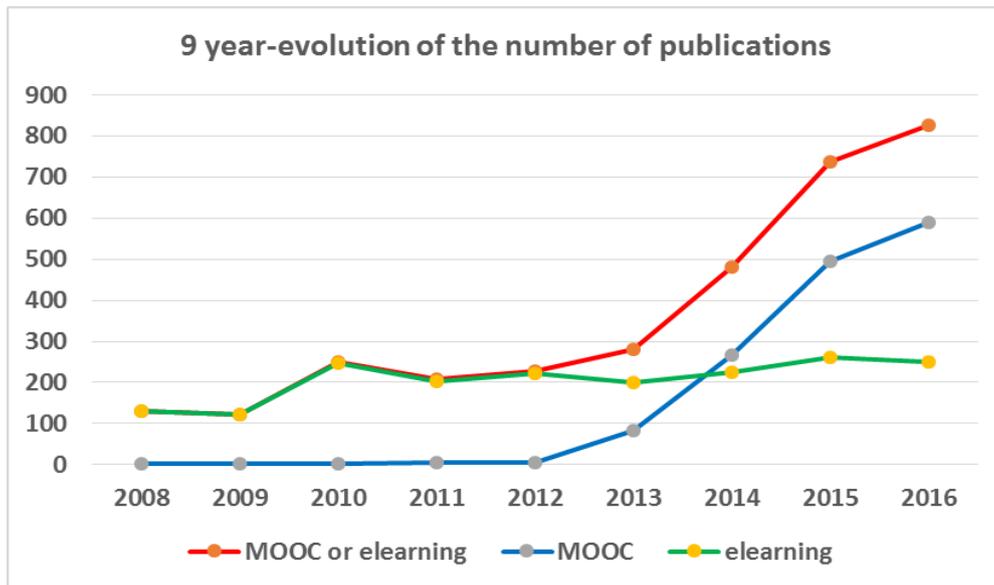


Figure 1. 9 year-evolution of the number of publications containing “MOOC” or “elearning” in topic.

Looking at Figure 2, one can intuitively say that the first four countries involved in MOOC/eLearning phenomena are United States, Spain, China and Romania. This is also proven by data in Table.3. The bigger the node is represented within the Figure, the more productive the country is. When assessing the numeric results, it is interesting to conclude that the first 5 countries published 46% out of the entire released academic production.



Figure 2. Country publication network

<sup>3</sup> The year of the MOOC, New York Times (2012). Retrieved from: <http://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html>. www.siteprice.org.

Table.3 Most productive countries (2008-2016) (in number of articles)

1	339	U.S.A.
2	298	Spain
3	273	Peoples Republic of China
4	245	Romania
5	172	England
6	151	Germany
7	127	Australia
8	97	Czech Republic
9	81	Canada
10	80	India

An interesting fact is revealed when assessing Tables 4 and 5 and Figure 3: even is the most cited and/or co-cited article released between 2008 and 2016 is MOOCs: A Systematic Study of the Published Literature 2008-2012 written by Liyanagunawardena, T.R., Adams, A.A. and Williams, S.A., the most cited publication in the mentioned period is the one written in 2003 by Everett M. Rogers, “Diffusion of innovation”.

Table 4. Most cited authors (2008-2016)

No.	Author, cited article
1	Rogers, E., 2003, Diffusion Innovation
2	Zhang, D.S., 2004, Commun. ACM, V47, P75
3	Siemens, G., 2005, Int. J. Instructional, V2
4	Ellaway, R., 2008, Med. Teach., V30, P455
5	Sun, P.C., 2008, Comput. Educ., V50, P1183
6	Conole, G., 2007, Open Flex. Learn Ser.
7	Hill, P., 2013, Emerging Student Pat.
8	Kop, R., 2011, Int. Rev. Res. Open. Dis., V12
9	Siemens, G., 2008, Connectivism Connect
10	Lewin, T., 2012, NY Times

Table 5. List of the most cited articles published 2008-2016 (source: ISI Web of Science)

No.	Article	Times Cited
1	Liyanagunawardena, T.R., Adams, A.A. & Williams, S.A. (2013). MOOCs: A Systematic Study of the Published Literature 2008-2012, in International Review of Research in Open and Distance Learning, 14, 3, 202-227	163
2	Kop, R., Fournier, H. & Mak, J.S.F. (2011). Pedagogy of Abundance or Pedagogy to Support Human Beings? Participant Support on Massive Open Online Courses, International Review of Research in Open and Distance Learning, 12, 7, 74-93	107
3	Jordan, K. (2014). Initial Trends in Enrolment and Completion of Massive Open Online Courses, International Review of Research in Open and Distance Learning, 15, 1	89
4	Hew, K.F. & Cheung, W.S. (2014, June). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges, Educational Research Review, 12, 45-58	66
5	Fini, A. (2009). The Technological Dimension of a Massive Open Online Course: The Case of the CCK08 Course Tools, International Review of Research in Open and Distance Learning, 10, 5	57

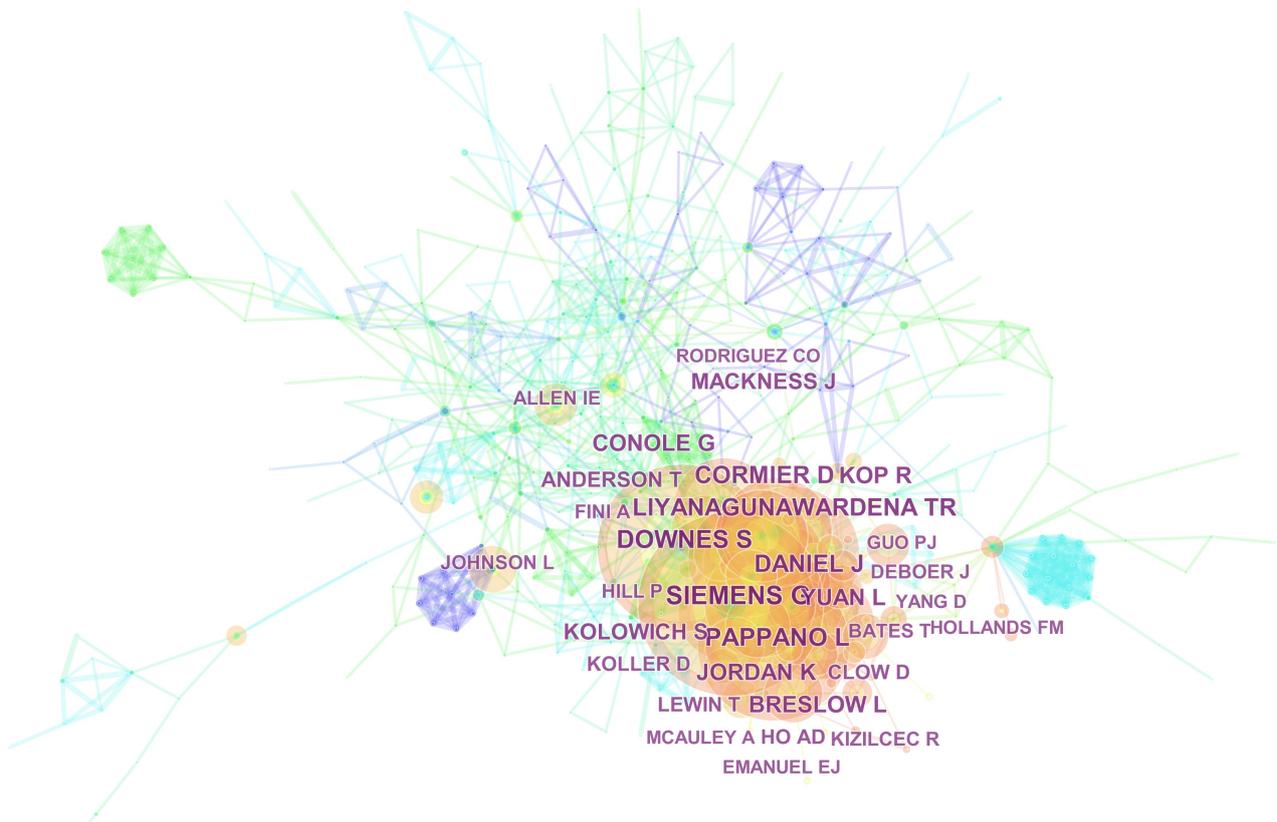


Figure 3. The most co-cited articles published 2008-2016

#### 4. Conclusions

MOOCs are a very timely topic of discussion both in academic environment and in personal development area. TechRepublic<sup>4</sup> published a report released by data scientist community Kaggle that concluded that “32% of full-time data scientists started learning machine learning or data science through a MOOC”.

Both numbers of MOOC platforms and users’ interest in MOOCs increased since 2012 – the year of MOOC therefore the present demarche aimed to investigate also the academic interest within this particular eLearning area between 2008 and 2016.

This analysis revealed that the number of released publications on this topic is constantly increasing.

Furthermore, the most productive countries (in terms of number of publications) are USA, Spain and China.

Moreover, given the top five of the most cited articles, the most representative journal within the domain is International Review of Research in Open and Distance Learning.

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<sup>4</sup> Report: 59% of employed data scientists learned skills on their own or via a MOOC, <https://www.techrepublic.com/article/report-59-of-employed-data-scientists-learned-skills-on-their-own-or-via-a-mooc/>

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