Journal of Advanced Science and Mathematics Education
Volume 2, Issue 1, 39 - 48.
e_ISSN : 2798-2351
DOI: 10.58524/jasme.v2i1.109

Trends, challenges and opportunities *for massive open online courses* (MOOCs) as mass education front in learning science

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Article Info

Article history:

Received: June 28, 2022
Revision: Dec 16, 2022
Accepted: Dec 17, 2022

Keywords:

Trend; Challenges: Opportunities; MOOCs.

Abstract

This study aims to determine the trends, challenges, and opportunities for Massive Open Online Courses (MOOCs) as a front-line education tool for science learning. The method used in this research is descriptive with a bibliometric approach. The secondary data used in this research consists of scientific articles sourced from databases within the scope of the period 2016-2021. The data collection was carried out using the Publish or Perish (PoP) software. The number of articles obtained was 200, and all the articles were selected in accordance with the criteria determined by the researcher. The Mendeley software was used to manage the metadata, resulting in a final number of 92 articles. MOOCs, as a future educational trend, have become a flexible learning system that can be accessed by many people to develop their skills and knowledge. The challenge for MOOCs as a future education tool is in terms of time and process. From the bibliometric analysis results, it was found that the growth of studies related to MOOCs in the field of cooperative/collaborative learning is still relatively small. Therefore, further studies on cooperative/collaborative learning related to MOOCs need to be conducted.

To quote this article: Kornia, E., Komikesari, H. & Saregar, A. (2022). Trends, challenges and opportunities *for massive open online courses* (MOOCs) as mass education front in learning science. *Journal of Advanced Science and Mathematics Education, 2* (1), 39-49.

INTRODUCTION

Education is currently being influenced by technological and scientific developments, resulting in a shift in the implementation of educational experiences. Education was traditionally obtained through formal means, but now there are many who provide non-formal education, such as activity training, which involves the use of the internet and technology. With the use of the internet, a lot of information can be easily accessed and shared through web-based networks and devices owned by the public (Eko, 2021). Wide-ranging knowledge and skills are needed to balance the development of technology.

The progress of ICT has a positive impact on education, one of which is improving the quality of human resources through the use of ICT. Education is required to find new approaches, models, and methods of learning that can oppose the challenges given. Education today is not limited by space and time, along with the technological developments that exist (Nita, 2017). The attachment of educational information and communication technology in the network (Online) is used as a flexible, easy accessed, distributed, and potentially open study room. Openness has developed from time to time. Due to the shifting patterns of education and learning, many researchers reveal that developments in distance education are necessary (Hannah, 2016). The current younger generation is dominated by the latest culture encompassed by digital processes (Mohismail, 2018). Due to this digital process, the institution of education will face a deep change. This matter becomes an opportunity and a way to improve the quality of education as well as a challenge for the world of education that exists in Indonesia (Barni, 2019).

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Currently, many platforms provide open learning resources that can be accessed by anyone just through web-based systems. This web-based system is more commonly known as MOOCs, as previously described. Massive Open Online Courses (MOOCs) present a new pattern in learning and education as well as delivering the material using the internet, creating changes and allowing many people to join for continuous learning (Hannah, 2016). Many studies suggest the need for development in distance education, and MOOCs exist as a new system of education and learning that uses the internet to convey material lectures from prestigious world universities and educational institutions, creating a kind of revolution where people can join each other (Hudha, 2020).

Massive Open Online Courses (MOOCs) as digital technology-based learning potentially. MOOCs are an opportunity for community members to take part in learning without bound by space, time, and presence strictly scheduled (Eko, 2021). Presence of MOOCs as a new pattern or system in learning activities provides many opportunities for every person Which want to add outlook as well as knowledge knowledge, especially For Student and Educator as well as Institution education for can move active in Study (Eko, 2021).

The importance of Massive Open Online Courses (MOOCs) as an innovative learning method at this moment needs to be continually developed. Based on previous studies related to Massive Open Online Courses (MOOCs), many have been carried out. However, the review related to bibliometric literature reviews, as in the research conducted by Sobral (2021), is still minimally done. Besides that, previous studies only discuss MOOCs in the field of educational techniques (Crues, 2018), computer knowledge (Rasul, 2019), medicine knowledge (Sobral, 2021), and MOOCs in general. Therefore, through the author's research, the urgency and necessity to explore the novelty trends, challenges, and opportunities of Massive Open Online Courses (MOOCs) in learning science need to be done.

METHOD

The research method used is descriptive research with a bibliometric approach. Analysis bibliometric aim for measure development publication article scientific and contribution scientific (Liu, 2015). Analysis bibliometric there is five stage (Setyaningsih, 2018). Bibliometric review is commonly used in disciplines and focused on journals, books, papers or other types of articles (Setyaningsih, 2018). Device The software used in this study is software that can retrieve and give quote academic (Baneyx, 2018).

Article metadata was obtained from search results based on criteria according to the boundaries of the problem. Based on the years 2016-2020 and the search keyword "MOOCs in learning science" in journals, articles were selected based on suitability of the keyword, title, and abstract, which were analyzed manually. Furthermore, the metadata was entered into Mendeley software to complete the identity of the journals. VOSviewer is a software tool that displays visualization results from mapping data. VOSviewer can classify keywords into different groups (Setyaningsih, 2018). This can display maps in a number of methods, each focusing on different aspects of the map (Eck, 2020). The following stages were used for bibliometric analysis (Hudha, 2020).

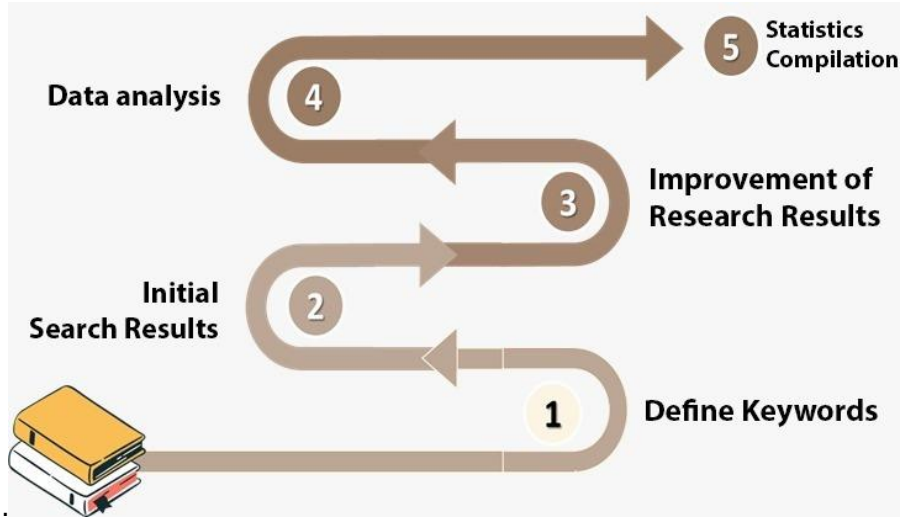

Figure 1. Stages analysis bibliometric

1. Search metadata done in databases scopus help device soft Publish or Perish. The search was carried out in September 2021 using keywords 'MOOCs in learning science'
2. 200 articles were obtained from the Scopus database based on 2016-2021 with say key 'MOOCs in learning science' And based on journal just. data article Which obtained Then saved in forats RIS Which capable keep with Good.
3. Of the 200 articles obtained, they were selected manually by the authors, apart from journals does not include search criteria. After being selected by the author to be featured in analysis. suitability abstract and title become criteria selection besides second matter That Also includes the key words 'MOOCs in science learning'. Selected articles and stored in RIS format will be analyzed Furthermore by using the device soft mendeley.
4. Results selection article Which has done in save into the mendeley, Then, be equipped based on the display specifications in Mendeley such as titles, keywords, abstract authors to source link journal.
5. All the selected and analyzed metadata is then displayed by the vosviewer provides three visualizations map, that is network visualization, visualization overlays and visualizations density. Map visualization has been explored in detail (Hakim, 2020). VOSviewer can work in a manner efficient with a number big data set and provide various analysis Which interesting in a manner visual and obviously (Liu, 2015). VOSviwer help para researcher with feature mapping visualization Which complete.

Scopus is the largest data center in the world which includes tens of millions of scientific literature which was published decades ago, is owned by Elsevier. There is accurate metadata for each scientific article, including abstracts, publication data and other references. It helps researchers to search, analyze and visualize research more effectively (Eck, 2020). In this study focused on the publication of international journals (Scopus) in the fifth period year final.

RESULTS AND DISCUSSION

Based on the metadata search results on Publish or Perish (PoP) with the keyword "MOOCs in Science Learning", 200 metadata were obtained from the Scopus database in the last five years (2016-2021). Out of the 200 metadata, there were six types: article, book, book chapter, conference paper, erratum, and reviews. Then, 92 metadata were chosen, which were all articles that were in accordance with the focus of the study. The results output from the software Publish or Perish (PoP)

were visualized by VOSviewer to determine the keywords. The software tool VOSviewer helps in displaying visualizations on databases in three different types: network visualization, overlay visualization, and density visualization.

After filtering the metadata, 92 articles were analyzed in the final five-year period. The articles received an average of 306.80 citations per year in the Scopus database. Based on the metadata search in the PoP sourced from the Scopus databases, 200 articles were found with specifications as listed in Table 1 below:

Table 1. Metric publication results search databases Scopus

Data Metric	Results Search
Say Key	'MOOCs in Learning Science'
Year Rise	2016-2021
Document	200
Quote	1534
Quotations/Year	306.80
Quote/Paper	7.67
Writer/Paper	0.99
h_index	18
g_index	29
hI_norm	19
hI_annual	3.60

***Massive open Online Courses* (MOOCs) as education period front in learning science.**

Massive open Online Courses present as education period front (Arnab, 2020; Kutty, 2019; Myungsuk, 2017; Sobral, 2021), Which Lots used by who just including students and teachers (Mohammad, 2021) on a large scale (Edward, 2018). The emergence of MOOCs increasingly being recognized as a potential (Dodzi, 2017), to provide a rich educational experience quality, learn skills new, advance career (Edward, 2018), preparation studying and addition study (Chen, 2020).

In room scope of higher education, 2021 known as the year MOOCs) (Baran, 2016). MOOCs can be the next step towards universal education (José, 2017). *Massive Open Online Courses* are classified into basic MOOCs which are characterized by their level of learning can followed by Who only (Alturkistani, 2020; Kumar, 2019; Kundu, 2020; Sobral, 2021) and the duration is short, only around 3-6 weeks and advanced MOOCs, namely the deep level of the material and longer duration. MOOCs provide several accessible learning materials individually or independently by choosing according to the field of interest (Lee, 2019). MOOCs can accessed in a manner individual Because in MOOCs That usually containing videos learning (Sobral, 2021), in the right style and way (Jasantos, 2016), which has been prepared by the teacher in so can with easy to understand.

Massive Open Online Courses as a popular learning system has an impact broader education (Kundu, 2020) for many people, especially independent students (Colin, 2017). To use get Skills new (Abwatted, 2018; Jaaqadir,2018) and knowledge addition (Jeya, 2019). MOOCs has succeed fulfil objective learner student and educator (Kumar, 2019) so that create opportunity new for learning And development competence (Ficirulli, 2016).

Learning in MOOCs which can followed by Lots participant (without limit) (Alturkistani, 2020; Edward, 2018), with material Which accessed in a manner open through website with take advantage of the online system through the website. MOOCS systems are used among others udemy , edX, canvas And Still Lots Again including edmodo and moodle (Chaw, 2019), Which of course every time it will increase. In Indonesia there are also many MOOCs platforms, IndonesiaX is Wrong One for example. Like a number of class on line on generally, MOOCs is flexible so that it can adjust the fields that are suitable to be followed. This is important Because principle MOOCs Which Which addressed For all person, However if learning done in real time allows the time difference will be a bottleneck. A number of MOOCs established by college tall top world (Jeya, 2019) and now a number of institution

build MOOCs they Alone For make content MOOCs in a manner independent and focus become provider MOOCs.

Use of various MOOCs by people from all over the world because of its amazing features, including unlimited registration, there are not many requirements (Mohammad, 2021). Feature which attached on MOOCs is involvement individual user with the MOOC platform (Cohen, 2018) and some MOOCs can be accessed for free though there are also paid ones and MOOCs also provide certificates (Chaw, 2019) for those who can follow and complete the lesson to the end. Achievement and student interaction that happen in MOOCs can give progress and increase performance which owned (Ruth, 2021). Seeing that is meaningful with MOOCs is enabling society can learn what they want quickly through non-formal learning systems. MOOCs means can become Wrong One road education formal Which There is moment This For get quality education, cheap and can be recognized later. Hence the Trend presence these MOOCs Keep going growing rapidly with its use Which the more Lots.

Challenge Massive open Online Courses (MOOCs) as education period front in learning science.

In general, there are two main challenges currently faced by MOOCs, namely levels low settlement (Abwatted, 2018; Azevedo, 2017; Chaw, 2019) caused by inadequate infrastructure (Kundu, 2020) and students are less engaged with MOOC content so they lose motivation to complete learning (Siti, 2018). Challenge What educators often face when using MOOCs is redundancy, a lack of facilities and exposure, incompetent knowledge in learning design and development MOOC (Jeya, 2019) and manage their time effectively (Pgdede, 2020). Study challenge on line without support tutors which dedicated require student for motivating self himself (Milligan, 2017) so that lower number separated school Which counted tall Which affect the effectiveness of their education (Mohammad, 2021). So, learning in *Massive Open Online Courses* (MOOCs), which are said to be an educational trend, also face challenges in time field and the process.

Visualization Results Analysis

Kindly complete VOSviewer help in visualization mapping metadata which got. Visualization on databases scopus displayed on picture 2 following:

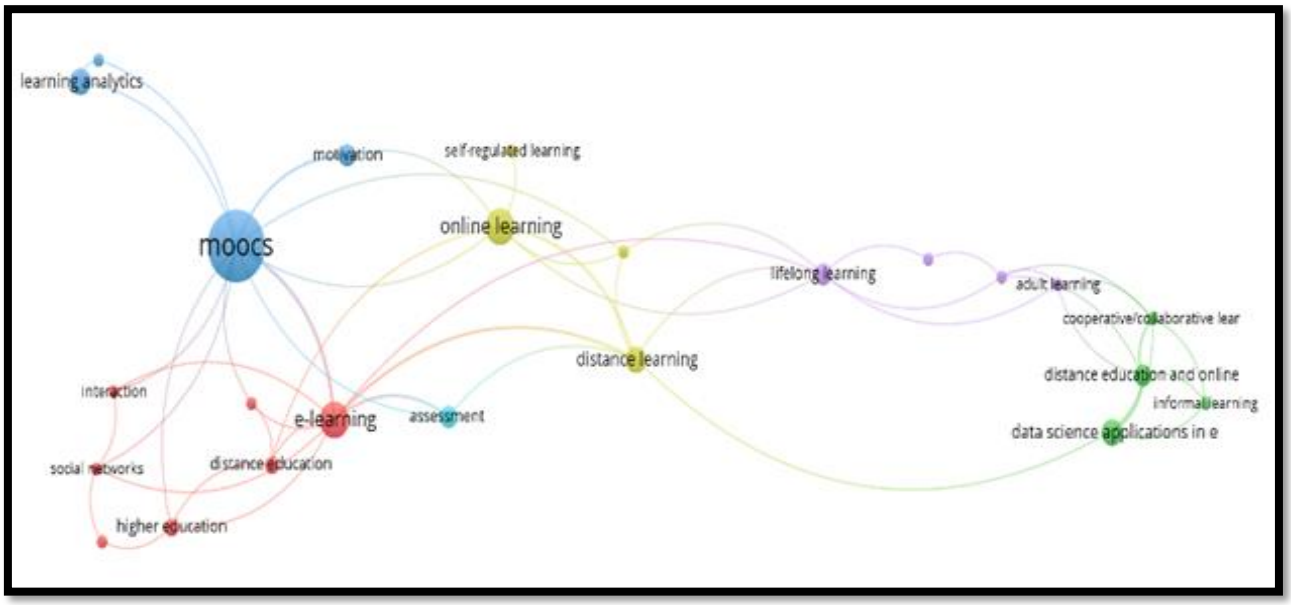

Figure 2. Visualization Network study

The mapping shown is the result of a collection of journal metadata obtained by Liu (2015). Based on the network data of 92 articles that met the criteria, the visualization of the metadata displayed the occurrence of keywords, titles, and abstracts with full calculation. Each term represents a keyword, title, or abstract related to the author's study. The author determined the minimum amount of term emergence to be two incidents, considering several factors. The researcher found 45 terms from the 347 terms that met the study's criteria related to MOOCs in learning science. From the 45 selected terms, the researcher eliminated terms that were not related to the study and obtained 24 terms.

The visualization displayed by VOSviewer shows six color clusters with color nodes which are different. The output results displayed show that there are six different color clusters, including red, green, dark blue, yellow, purple, and light blue. The network visualization displayed in Table 2 is shown below:

Table 2. Clusters Color Which Generated

Clusters	Term	Occurrences
First	*distance learning*	8
	Digital education	2
	e-learning	4
	Electronics	2
	higher education	3
	interactions	2
	social network	2
Second	*cooperative/ collaborative Learning*	2
	science application elearning	5
	distance education	4
	informal elearning	2
Third	*educational data mining*	2
	learning analytics	5
	MOOCs	20
	motivation	4
Fourth	*community of inquiry*	2
	distance learning	5
	on line learning	8
	self-regulated learning	2
Fifth	*adult learning*	2
	learning communities	2
	lifelong learning	4
	teaching/learning strategy	2
Sixth	*Assessment*	4

The keywords contained in each cluster represent research on "MOOCs in Learning Science" that was conducted in the final five years. Each cluster is distinguished by a different color, which explains the writers' contributions to the scientific work. The descriptions of the clusters explain the research that has been conducted recently and extensively. Each color represents a year that is available from 2018 to 2020. The yellow color concentration shows the latest research done in 2020, while the blue color concentration shows the research that has been conducted for several years and is still relevant to future discussions, as seen in the picture below.

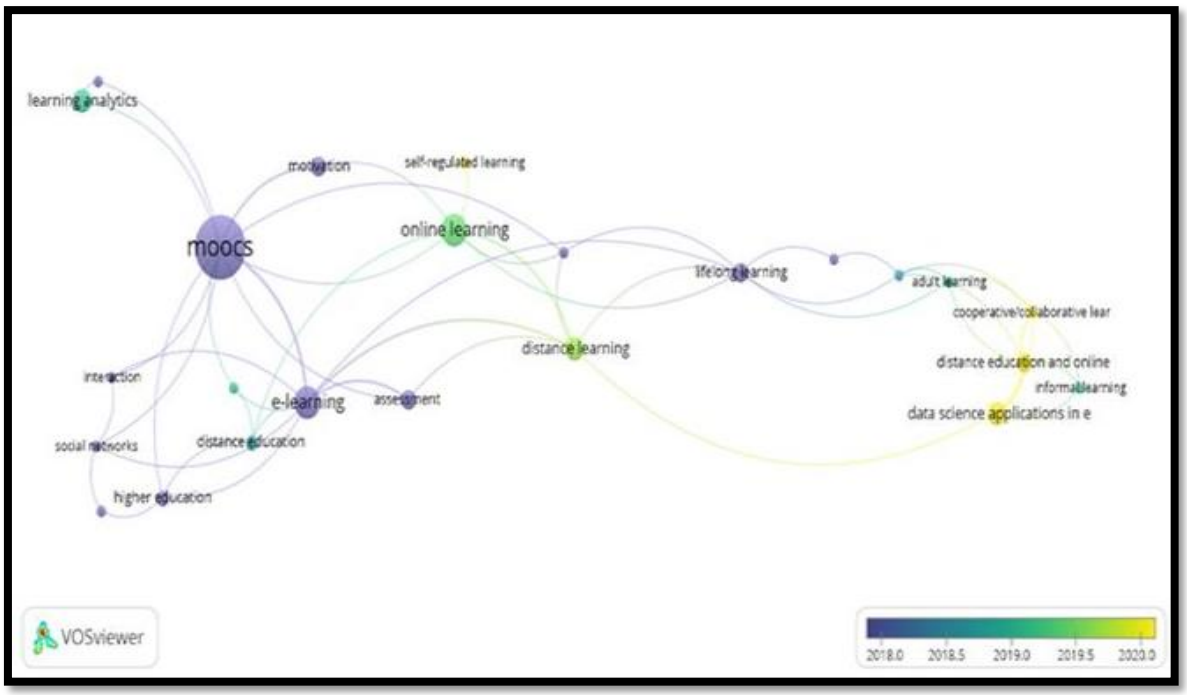

Figure 3. Mapping visualization overlays study

Besides thats from *clusters* Also will detected related trend Which appear and change critical in which disciplines to study, researchers will be able to identify research gaps and the limits of the research within which they can participate in further research. Study latest Which seen on visualization overlays consists from topic Which related with *cooperative/ collaborative learning*, *data science application e-learning, distance education and online, And self-regulated learning.* On picture 3 following will displayed nodes Which show level *occurrences* something topic.

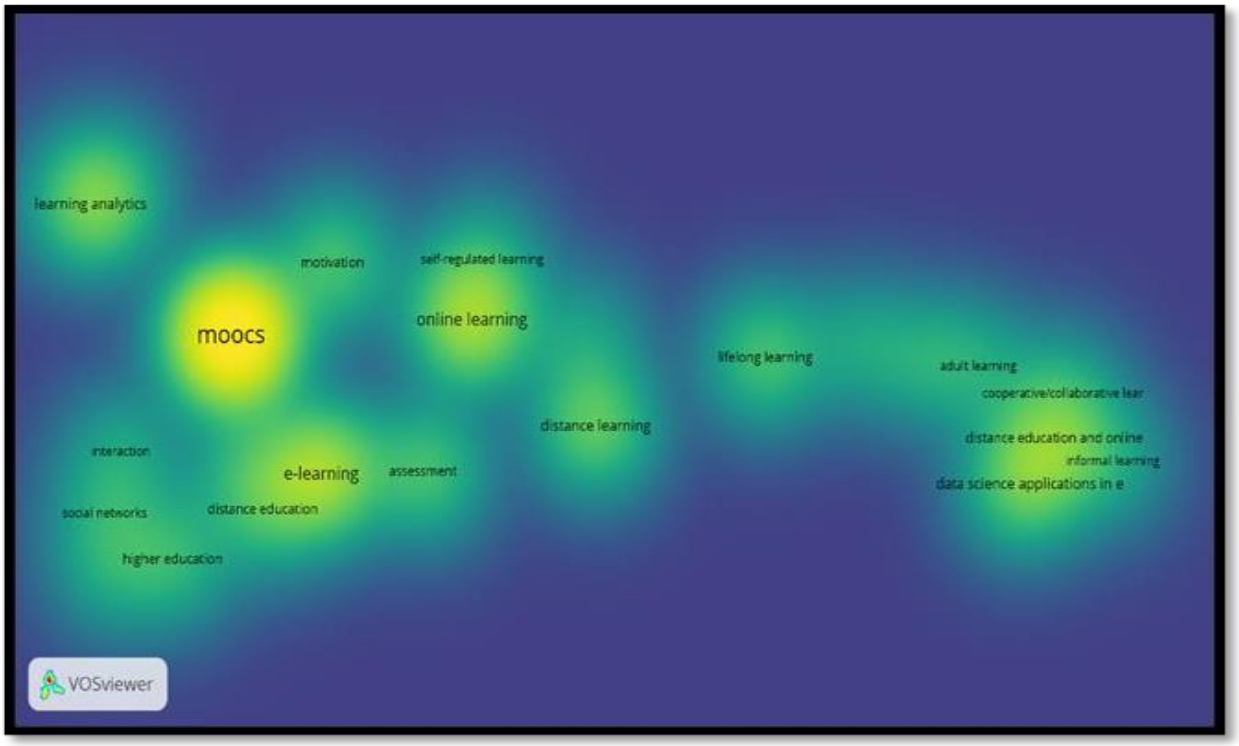

Figure 4. Mapping Visualization Density Study

The more concentrated a topic is, the more occurrences it has and the taller it appears, which indicates that the topic has been extensively researched. However, a topic related to Massive Open Online Courses (MOOCs) in learning that is related to cooperative/collaborative learning still has the opportunity to be further researched. This literature review is qualitative in nature and is based on the author's personal study. Therefore, it is recommended to conduct further research on cooperative/collaborative learning, as not much research has been done on this topic yet.

CONCLUSION

Based on a systematic literature review conducted by the authors, it has been concluded that Massive Open Online Courses (MOOCs) are the future of education and have become a learning system that can be accessed by an unlimited number of participants through websites to develop their skills and knowledge. MOOC systems are used by many platforms, such as udemy, coursera, edmodo, EdX, canvas, moodle, and more. The main challenge for MOOCs as an educational system lies in the time and process. However, MOOCs provide many opportunities for their users, such as being open, free, and flexible. Based on the visualization results generated by the VOSviewer software, recommendations for future research opportunities are related to cooperative/collaborative learning.

AUTHOR CONTRIBUTION STATEMENT

EK : Idea, desain, conceptualizon, analysis, and editing
HK : Drafting the manuscript, correction, directing, and final approval
AS : Editing, reviewing, proofreading, and technical support

REFERENCE

Abwatted & Miri, B. (2018). Motivating factors of MOOC completers: Comparing between university-affiliated students and general participants. *Internet and Higher Education*, *37*, 11-20. https://doi.org/10.1016/j.iheduc.2017.12.001

Abrar, A. (2020). Massive open online course evaluation methods: Systematic review. *Journal of Medical Internet Research, 22*(4). https://doi.org/10.2196/13851

Alturkistani, A., Lam, C., Foley, K., Stenfors, T., Blum, E. R., Van Velthoven, M. H., & Meinert, E (2020). Massive open online course evaluation methods: Systematic review. https://doi.org/10.2196/preprints.13851

Azevedo. (2017). Mooc success factors: Proposal of an analysis framework. *Journal of Information Technology Education: Innovations in Practice 16*, 233-251. https://doi.org/10.28945/3861

Baneyx A. (2008) "Publish or Perish" sebagai metrik kutipan yang digunakan untuk menganalisis keluaran ilmiah dalam humaniora: studi kasus Internasional di bidang ekonomi, geografi, ilmu sosial, filsafat, dan sejarah 363-71

Baran, T. A., Baraniuk, R. G., Oppenheim, A. V., Prandoni, P., & Vetterli, M. (2016). MOOC adventures in signal processing: Bringing DSP to the era of massive open online courses. *IEEE Signal Processing Magazine*, *33*(4), 62-83. https://doi.org/10.1109/MSP.2016.2556004

Barni, M. (2019). Tantangan pendidik di era millennial. *Jurnal transformatif (islamic studies)*, *3*(1), 99-116.

Chaw & Tang. (2019). Driving high inclination to complete massive open online courses (MOOCs): Motivation and engagement factors for learners. *Electronic Journal of e-Learning 17*, 118. https://doi.org/10.34190/JEL.17.2.05

Chen, C., Sonnert, G., Sadler, P. M., Sasselov, D., & Fredericks, C. (2020). The Impact of student misconceptions on student persistence in a MOOC. *Journal of Research in Science Teaching 57*(6), 879-910. https://doi.org/10.1002/tea.21616

Cohen & Holstein. (2018). Analysing successful massive open online courses using the community of inquiry model as perceived by students. *Journal of Computer Assisted Learning 34*, 544-556. https://doi.org/10.1111/jcal.12259

Colin, M & Allison, L. (2017). Why study on a MOOC? The motives of students and professionals. *International Review of Research in Open and Distance Learning 18*(2), 92-102. https://doi.org/10.19173/irrodl.v18i2.3033

Crues, R W, Genevieve M Henricks, Michelle Perry, & Suma Bhat. (2018). How do gender, learning goals, and forum participation predict persistence in a computer science MOOC?. *ACM Transactions on Computing Education, 18*(4). https://doi.org/10.1145/3152892

Dodzi, A & Stefania, M. (2017). Learning from decades of online distance education: MOOCs and the community of inquiry framework. *Journal of E-Learning and Knowledge Society 13*(2), 21-32.

Eck N, J, & Waltman L. (2020). Survei perangkat lunak: VOSviewer, program komputer untuk pemetaan bibliometrik. *Scientometrics, 84*. 523-38.

Edward, M. Alturkistani, A., Brindley, D., Carter, A., Wells, G., & Car, J. (2018). Protocol for a mixed-methods evaluation of a Massive Open Online Course on Real World Evidence. *BMJ Open 8*(8), 1-5. https://doi.org/10.1136/bmjopen-2018-025188

Eko, R. (2017). MOOCS sebuah tren pendidikan masa depan. *Prosiding Seminar Nasional Pendidikan Program Pascasarjana Universitas Pgri Palembang*. (pp. 7-12).

Ficirulli, Elia, G., Lorenzo, G., Margherita, A., & Solazzo, G. (2016). The Use of MOOCs to support personalized learning: An application in the technology entrepreneurship field. *Knowledge Management and E-Learning 8*, 2073-7904, 109-23. https://doi.org/10.34105/j.kmel.2016.08.008

Hakim, L. (2020). Analisis bibliometrik penelitian inkubator bisnis pada publikasi ilmiah terindeks scopus. *J. Ilm. Manaj, 8*. 176-89.

Hannah, S. (2016). Online Learning: The brave new world of massive open online courses and the role of the health librarian. *Health Information and Libraries Journal 33*(1), 84-88. https://doi.org/10.1111/hir.12134

Hudha, M. N., Hamidah, I., Permanasari, A., Abdullah, A. G., Rachman, I., & Matsumoto, T. (2020). Low carbon education: A review and bibliometric analysis. *European Jurnal Of Education Research, 9*(1), 319-329. https://doi.org/10.12973/eu-jer.9.1.319

Jaaqadir & Imran. (2018). Learning 101: The untaught basics. *IEEE Potentials 37*(3), 33-38. https://doi.org/10.1109/MPOT.2017.2749408

Jasantos-Espino, Afonso-Suarez, M & Guerra-Artal, C. (2016). Speakers and boards: A survey of instructional video styles in MOOCs. *Technical Communication, 63*(2), 101-15.

Jazimatul, H. (2018). Implementasi MOOCS di pendidikan ilmu perpustakaan dan informasi (sebuah peluang dan tantangan di Indonesia). *Anuva: Jurnal Kajian Budaya, Perpustakaan, dan Informasi, 3*(3), 247-56. https://doi.org/10.14710/anuva.3.3.247-256

Jeya, A, K & Hosam, A. (2019). An investigation of Novice Pre-University Students' Views towards MOOCs: The Case of Malaysia. *Reference Librarian, 60*(2), 134-47. https://doi.org/10.1080/02763877.2019.1572572

Jose, A. (2017). Mooc success factors: Proposal of an analysis framework. *Journal of Information Technology Education: Innovations in Practice 16*(1), 233-51. https://doi.org/10.28945/3861

Kumar. (2019). A Study of Veterinary Scholars' Perception of MOOCs. *Journal Information and Learning Science 120*, 743-757https://doi.org/10.1108/ILS-04-2019-0031

Kundu & Bej. (2020). Perceptions of MOOCs among Indian State University Students and Teachers. *Journal of Applied Research in Higher Education 12*, 1095-1115. https://doi.org/10.1108/JARHE-08-2019-0224

Kutty, K. (2019). A study of veterinary scholars' perception of MOOCs. *Information and Learning Science 120*(11), 743-57. https://doi.org/10.1108/ILS-04-2019-0031

Lee, Y, C & Chun, M, G. (2019). Driving High Inclination to Complete Massive Open Online Courses (MOOCs): Motivation and engagement factors for learners. *Electronic Journal of E-Learning 17*(2), 118-30. https://doi.org/10.34190/JEL.17.2.05

Liu Z, Yin Y, Liu W & Dunford M (2015) Memvisualisasikan struktur intelektual dan evolusi penelitian sistem inovasi: Analisis bibliometrik. *Scientometrics, 103*(1), 135-158. https://doi.org/10.1007/s11192-014-1517-y

London, J &Cynthia Y. (2016). The Role of Massive Open Online Courses (MOOCs) in engineering education: Faculty perspectives on its potential and suggested research directions. *International Journal of Engineering Education 32*(4) (2016), 1788-1800.

Milligan & Littlejohn. (2017). Why study on a MOOC? The motives of students and professionals. *International Review of Research in Open and Distance Learning 18*, 92-102. https://doi.org/10.19173/irrodl.v18i2.3033

Mohammad, S. (2021). A comparative analysis of dropout prediction in massive open online courses. *Arabian Journal for Science and Engineering, 46* (2), 1845-1861. https://doi.org/10.1007/s13369-020-05127-9

Mohismail, M. E., Hashim, S., Ismail, I. M., Ismail, A., Razali, N., Daud, K. A. M., & Khairudin, M. (2018). Penggunaan massive open online course (Mooc) dalam kalangan pelajar vokasional. *Journal Of Nusantara Studies (Jonus), 3*(1), 30. https://doi.org/10.24200/jonus.vol3iss1pp30-41

Myungsuk, L & Eunsook Bae. (2017). Development of hybrid teaching method using MOOCs. *International Journal of Intelligent Engineering and Systems 10*(3), 257-62, https://doi.org/10.22266/ijies2017.0630.29

Nita, L & Vina, S. (2017). Pengembangan multimedia interaktif berupa massive open online courses (Moocs) fisika SMA. *Prosiding Snips*. (pp. 590-94).

Pgdde, B. (2020). The importance and meaning of session behaviour in a MOOC. *Computers and Education 146*, 1-23. https://doi.org/10.1016/j.compedu.2019.103772

Rasul, T. (2019). The trends, opportunities and challenges of halal tourism: A systematic literature review. *Tourism Recreation Research, 44*(4), 434-50 https://doi.org/10.1080/02508281.2019.1599532

Ruth, C & Juan, C, R, Z. (2021). Improving learner engagement in MOOCs using a learning intervention system: A research study in engineering education. *Computer Applications in Engineering Education 29*(4), 733-49. https://doi.org/10.1002/cae.22316

Setyaningsih I, Indarti N & Jie F (2018). Bibliometric analysis of the term "green manufacturing. *Int. J. Manag. Concepts Philos. 11,* 315 https://doi.org/10.1504/IJMCP.2018.093500

Siti, F., Ahmad, F., Sazilah, S., & Norasiken, B. (2018). Wearable technology in education to enhance technical MOOCs. *International Journal on Advanced Science, Engineering and Information Technology, 8*(5), 1873-81. https://doi.org/10.18517/ijaseit.8.5.3929

Sobral, S R. (2021). Massive open online courses: A bibliometric review. *International Journal of Information and Education Technology 11*(5), 205-211. https://doi.org/10.18178/ijiet.2021.11.5.1513

Wibisono, B. (2020). Humaniora dan era disrupsi. *E-Prosiding Seminar Nasional Pekan Chaiil Anwar, 1*(1), 19-30.