ISSN: 2583-7354



International Journal of Emerging Knowledge Studies

Publisher's Home Page: https://www.ijeks.com/



Fully Open Access

Research Paper

Global Publications on Open Education Research: A Scientometric Analysis (1992-2021)

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Article Info: - Received : 06 December 2022 Accepted : 19 December 2022 Published : 22 December 2022



This paper reviews the pervasive growth of research literature in open education worldwide. This scientometric study aims to identify and evaluate the emergence of open education research by analyzing and visualizing publication trends from 1992-2021. The investigation on Open Education and Open Education Resources, published from 1992 to 2021, was conducted by collecting data from the Web of Science database, utilizing the search string TITLE. Through the course of this, a total of 2,785 records were successfully obtained. Furthermore, data analysis was undertaken, with the help of MS Excel, Bibexcel and Biblioshiny, along with mathematical and statistical formulas. All of this was done in September 2022. The results indicate that open education publications have been growing significantly in recent decades, with the United States and India being the major contributors. This study also finds that the number of co-authors involved in open education research is increasing, with the

highest proportion of multi-authored articles published in 2021. The data indicates that the average number of citations has grown throughout the review. Further, the results suggest that open education research is highly interdisciplinary, with the highest overlap found in computer science and engineering. The findings provide an insight into the current state of open education research, contributing to further understanding of this sub-domain of educational research.

Keywords: Open Education, Research, Scientometrics, Publications, Analysis



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1.INTRODUCTION

Open is a popular term in academia in the twenty-first century(Elf et al., 2015). However, the concept of academic openness has been introduced previously. For many years, distance education has been a part of conventional education. However, Open Education has brought about a paradigm shift in distance education (de Langen, 2011). Comenius proposed the openness of education for all in the 17th century with his statement, "teaching all things to all men," which is regarded as the earliest concept of Open Education (Wong & Li, 2019). Open

education is not limited to sharing educational resources, tools, and practices; it is a pedagogical movement to make education accessible, affordable, and non-discriminatory for all. The European Commission (2019) defines open education as "a method of delivering education that frequently employs digital technologies." It aims to increase access and participation by removing barriers and making learning accessible, plentiful, and adaptable. It provides numerous opportunities for teaching and learning, building and sharing knowledge (D'Antoni, 2009). In addition, it offers multiple entry points to formal and non-formal education and connects the two (A. Vellaichamy, 2015).

Accordingly, many higher education institutions worldwide make their teaching, learning, and research resources accessible via the Internet under an open license. This enables students worldwide to access, download, and use the resources, including textbooks and video lectures, for free and in a legal manner (Suhr, 2016). Open Education is a rapidly expanding research field in traditional Education. Rapid digital communication and network technologies advancements have given Open Education research a new perspective (Sathish Kumar et al., 2021). Thus, Open Education research opportunities have become versatile and diverse. Consequently, it is crucial to comprehend the research trends and patterns of collaboration in the "Open Education" research field (Ramalingam & Chamy, 2016).

2. SCOPE AND COVERAGE

The scope of the present study is limited to analysis research on Open Education Resources from India between 1992 and 2021 using Scientometric parameters extracted from the Web of Science database. Furthermore, the scope of this study is limited to the 2,785 papers published on Open Education Resources from around the world and indexed in the web of science database during the specified time frame.

3. REVIEW OF LITERATURE

The development and structure of global literature on open education published between 2001 and 2020(Hadagali, 2022). The authors read 1,119 bibliographic records from the Scopus database about "open education." This study identified the most prolific authors, institutions, countries, and most cited journals in the "open education" research field. Tlili et al., (2021) conclude that collaboration should be fostered in this field. The previous studies examine from 2004 to 2020, and the growth of the global literature on open educational resources is reviewed. From the database's first publication until 2020, 1,751 records were extracted. This study concluded that there was a need for more collaborative research and cooperation among authors with diverse economic, cultural, and institutional backgrounds to anticipate excellent research on open educational resources (OERs) for a more effective online teaching-learning process(Marcus-Quinn, 2016). The bibliometric mapping analysis of open educational practices (OEP) research papers in the Web of Science and Scopus databases. The software VOSviewer was used to determine the most general keywords and terms in the abstracts and titles. I also used this software to analyze coauthorship and citations in the study (Kumar & Mahendraprabu, 2021). This study extended and supplemented previous findings in the OEP literature by identifying future directions for OEP research using bibliometric techniques. The emerging trends in OER research conducted in China between 2001 and 2019. CNKI, the most important academic database in China, identified 563 papers as the source of reference. OER studies needed to

be more specific and in-depth in China; the majority of researchers were from pedagogy; more researchers from other fields, such as computer science and economics, were needed (Bansal, 2020). The bibliometric analysis quantifies the MOOC scientific output in the form of articles in the JCR and Scopus databases from 2010 to 2013. They analyzed semantic keywords with social network analysis using UCINET-generated networks and VOSviewer for visual representation. Results indicated that the number of articles published and citations received in both databases has a moderate-to-low impact on significance (Brandle, 2018). The conceptual network of relationships in the abstracts and keywords did not correspond with the current analysis of educational media in general. The global research output on "electronic resources" from 1999 to 2018. The Scopus database collected data on citations between the publication date and 20 April 2019. Research should be accelerated and globally promoted. Researchers and scientists should engage in international collaboration. National and international funding agencies should actively encourage research and construct a solid foundation(Zhu, 2020). The title of eresources from 1993 to 2018 based on the Scopus database. During the study period, 167 research articles were published in e-resources. These researched advantages oferesources have captured the attention of library patrons to a significant degree. Users heavily relied on e-resources for their essential information and to stay current in their field(Sunil Kumar Yadav, Manoj Kumar Verma, 2019).

4. OBJECTIVES

The primary objective of this study is to analyze and determine the productivity of "Open Education Resources" publications between 1992 and 2021. Among the specific aims of the study are the following:

- To understand the primary published documents in Open Education Resources;
- ❖ To calculate the yearly Average Citation per paper in the Open Education Resources;
- To know Author's Production Over Time in the Open Education Resources;
- ❖ To analyze the various top twenty Author Collaboration network in Open Education Resources;
- To identify the top productive Citation Reference, Authors, and Authors' Countries in Open Education Resources;
- ❖ To identify each Author's top twenty h-index values in Open Education Resources.

5. METHODOLOGY

The investigation is based on the research published on Open Education and Open Education Resources from 1992 to 2021, collected from the Web of Science database. The data was collected from a Web of Science database using the search string TITLE in September 2022. A total of 2,785 records were published on the subject of Open Education and Open Education Resources from the Web of Science database. MS Excel, Bibexcel, and Biblioshiny, as well as mathematical and statistical formulas, were used to conduct additional analysis on the extracted data.

6. Analysis

Table -1: Document-wise distribution of publications on Open Education Resources

Sl. No	Document Types	Total No. of Publications	Percentage of Publication	
1	Article	2467	88.58	
2	Review	133	4.78	
3	Proceedings Paper	84	3.02	
4	Editorial Material	51	1.83	
5	Early Access	Early Access 28		
6	Meeting Abstract	9	0.32	
7	Book Review	6	0.22	
8	Book Chapter	4	0.14	
9	Letter	2	0.07	
10	Reprint	1	0.04	
	Total	2785	100	

Document Types

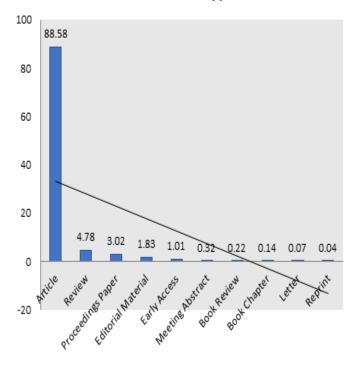


Fig-1: Document-wise distribution of publications on Open Education Resources

Table and **Fig -1**: show the document-wise publication distribution from the considerable study period. The highest 2467 (88.58 %) of publications were article type, followed by Review with 133(4.78%) publications. Proceedings Paper was with 84(3.02%) publications. Editorial Material was with 51(1.83%) publications. Early Access was with 28(1.01%) publications. Meeting Abstract was with 9(0.32%) publications. Book Review was with 6(0.22%) publications. Book Chapter was with 4(0.14%)

publications. letter was with 2(0.07%) publications, And Reprint was with 1(0.04%) publication.

Table -2: Yearly Average Citation Per Paper on Open Education Resources

year	No. of Article	Mean Total Citation Per Article	Mean To tal Gitation Per year	Citable Years
1992	7	87.57	2.92	30
1993	5	4.40	0.15	29
1994	12	6.67	0.24	28
1995	16	6.06	0.22	27
1996	11	24.09	0.93	26
1997	8	12.13	0.48	25
1998	17	19.24	0.80	24
1999	13	12.77	0.56	23
2000	25	31.48	1.43	22
2000	13	91.15	4.34	21
2002	21	44.81	2.24	20
2003	24	25.83	1.36	19
2004	29	35.72	1.98	18
2005	23	15.87	0.93	17
2005	37	36.89	2.31	16
2007	39	24.97	1.66	15
2008	53	52.91	3.78	14
2009	63	24.63	1.89	13
2010	80	27.05	2.25	12
2010	73	24.75	2.25	11
2012	122	23.28	2.33	10
2013	156	26.33	2.93	9
2014	127	24.49	3.06	8
2015	157	26.06	3.72	7
2015	170	20.07	3.35	6
2017	218	23.74	4.75	5
2018	245	14.36	3.59	4
2019	294	8.51	2.84	3
2020	338	7.11	3.56	2
2020	389	4.98	4.98	1
Total	2785	787.92	67.83	

Table 2 shows the fluctuating trend in the No of Articles over the study period. The highest number of Articles recorded was in the year 2021 (389), followed by 2020 (338), and the lowest was recorded in the year 1993 (5) and followed by the mean total citation per article over the study period. The highest complete source per article was (91.15), followed by (87.57), and the lowest was recorded for the year (4.40) and followed by the mean total citation per year over the study period. The highest complete authority per year was (4.98), followed by (4.75), and the lowest was recorded for the year (0.15) and followed by the citable years recorded over the study period. The highest citable years was 1992 (30), followed by 1993 (29), and the lowest was recorded for the year 2021(1).

Table -3: Author's Production over Time in Open Education Resources

											Total
										Total	Citation
Author	2013	2014	2015	2016	2017	2018	2019	2020	2021	Citation	Per Year
Barnighausen T	0	1	0	0	1	1	1	1	1	1882	322.34
Burgos D	0	0	0	2	0	2	2	1	4	99	27.146
Burley SK	0	0	1	0	0	1	0	1	1	497	77.342
Chan TM	0	0	1	0	2	2	1	1	0	104	19.192
Hilton J	0	1	1	2	0	0	1	1	0	374	56.888
Huang RH	1	0	0	0	0	0	1	1	3	56	18.267
Kim D	0	0	0	0	1	1	2	1	1	1759	299.15
Kimmons R	0	0	1	1	2	2	0	0	0	67	9.981
Lee J	0	0	0	0	0	1	3	1	2	41	10.9
Thoma B	0	0	3	0	3	2	0	0	0	250	35.692
Total	1	2	7	5	9	12	11	8	12	5129	876.90

Table 3 shows the fluctuating trend in the Author's total citations over the study period. The highest total citation was Barnighausen T (1882), followed by Kim D (1759), and the lowest total citation was Lee J (41). Followed by the Author's total citation per year was Barnighausen T (322.34), followed by Kim D (299.15), and the lowest total citation per year was Lee J (10.9).

Table -4: Author Collaboration Network in Open Education Resources

S.No	Author	Cluster	Betweenness	Closeness	Page Rank
1	Burgos D	1	1.2	0.16667	0.036051
2	Huang RH	1	0.4	0.16667	0.03033
3	Tlili A	1	0.4	0.16667	0.03033
4	Nascimbeni F	1	0	0.125	0.021669
5	Bozkurt A	1	4	0.16667	0.014571
6	Kalz M	1	0	0.1	0.006585
7	Thoma B	2	0	1	0.023256
8	Chan TM	2	0	1	0.023256
9	Anderson T	3	0	1	0.023256
10	McGreal R	3	0	1	0.023256
11	Hilton J	4	0	0.5	0.024731
12	Wiley D	4	0	0.5	0.020305
13	Fischer L	4	0	0.5	0.024731
14	Burley SK	5	0	0.33333	0.022272
15	Zardecki C	5	0	0.33333	0.026206
16	Berman HM	5	0	0.33333	0.022272
17	Goodsell DS	5	0	0.33333	0.022272
18	Hermjakob H	6	0	0.05	0.023256
19	Hunter C	6	0	0.05	0.023256
20	Pandey A	6	0	0.05	0.023256

Table 4 shows the fluctuating trend in the author's collaboration network over the study period. The authors Burgos D, Huang RH, Tlili A, Nascimbeni F, Bozkurt A, Kalz M Cluster is (1). Followed by authors Thoma B, Chan TM Cluster is (2), followed by authors Anderson T, McGreal R Cluster is (3). followed by Hilton J, Wiley D, Fischer L Cluster is (4). followed by Burley SK, Zardecki C, Berman HM, Goodsell DS Cluster is (5). he was followed by Hermjakob H, Hunter C, and Pandey A Cluster (6) and the mean Betweenness over the study period. The highest Betweenness Bozkurt A (4), followed by Burgos D (1.2), and the lowest Betweenness Nascimbeni F, Kalz M, Thoma B, Chan TM, Anderson T, McGreal R, Hilton J, Wiley D, Fischer L, Burley SK, Zardecki C, Berman HM, Goodsell DS, Hermjakob H, Hunter C and Pandey A (0). Followed by the mean Closeness over the study period. The highest Closeness Thoma B, Chan TM, Anderson T, and McGreal R (1). followed by Burley SK, Zardecki C, Berman HM, and Goodsell DS (0.33333), and the lowest Closeness Hermjakob H, Hunter C, and Pandey A (0.05). Followed by the mean PageRank over the study period. The page rank Huang RH, Tlili A (0.03033) authors first rank. He is followed by Kalz M (0.006585), the author's second rank, and Burgos D (0.036051) author's last rank.

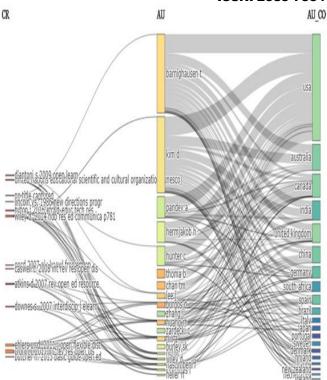


Fig -2: Illustration of three elements, consisting of a list of Citation Reference, Authors, and Authors' Countries

Three fields plot

The three fields plot shown below illustrates three elements top twenty, consisting of a list of Citation Reference, Authors, and Authors' Countries (Fig. 2). These three elements are plotted with gray linkages that show their relationship with each other, starting from the name of the citation reference, followed by the author. Each author's country is then linked to the topic of their publication. The size of each rectangle in each list indicates the number of papers associated with that element.

The first element, on the left, is the citation reference. Thirteen references were indexed in the three fields plot as having authors on the Burgos.d, Huang.RH, Rlili. A. The top journal that published the most papers on these references was Atkins.d 2007 rev. Open ed resources and Downes. s 2007 internship j learn, depicted with a light green rectangle and connected to several authors' countries USA, Australia, Canada, India, United Kingdom.

The second element in the middle contains the authors' names. Authors who reference journal articles that were recognized are associated with previous elements and linked to the Wiley d 2014 ndb res ed communica P 781 and Po title captured author's elements. However, some others did not author, and therefore do not have any connection with any of the authors listed, such as Thoma b and Pandey a. Each of the author's countries is on the right. The 19 top authors are listed in this plot. The rectangle size shows the number of papers written by each author. Barnighausen, Kim, Pandey, Hermjakob, and Hunter had the largest rectangles in this plot.

The third element contains the most Authors' countries. Twenty Country authors are listed, and most Country authors were from the USA, as indicated by the size of the red rectangle, which dominated the other rectangles. It also appeared that the USA authors almost published articles. In addition to the USA, this plot also shows several other countries that were widely authors. Published articles, such as Australia, Canada, India, United Kingdom, and China.

Table -5: Top Twenty Productive Authors

			Single		
SI.		Total	Authors'	Total	
No	Author	Publications	Citation	Citation	h-index
1	Thoma B	8	250	250	8
2	Burgos D	12	93	110	7
3	Huang RH	7	62	67	6
4	Hilton J	6	374	374	6
5	Chan TM	7	99	104	6
6	Hunter C	5	71	71	5
7	Burley SK	5	516	516	5
8	Wiley D	5	193	193	5
9	Hermjakob H	5	74	74	5
10	Kimmons R	6	67	67	5
11	Barnighausen T	6	1878	1882	5
12	Nascimbeni F	6	78	82	5
13	Zardecki C	5	945	945	5
14	Tlili A	7	51	56	5
15	Seymour SL	4	59	59	4
16	Bradshaw R	4	59	59	4
17	Chan DW	4	59	59	4
18	Moritz RL	4	59	59	4
19	McGreal R	4	143	143	4
20	Slotta D	4	59	59	4

Table-5 presents the top twenty productive authors in "Open Education Resources" research. 11666 authors have contributed 2785 papers in 'Open Education Resources 'research. Among the top twenty productive authors' publications, Burgos D has published the maximum (12) research publications of the total publications, followed by Thoma B (8), and the lowest authors' publications were Seymour SL, Bradshaw R, Chan DW, Moritz RL, McGreal R, and Slotta D (4). Followed by the single authors' citation Barnighausen T maximum (1878), single authors' citation, followed by Zardecki C (945), and the lowest single authors' citation Tlili A (51). Followed by the total citation Barnighausen T maximum (1882) total citation, followed by Zardecki C (945), and the lowest total citation Tlili A (56). Followed by the h-index Thoma B maximum (8) h-index, followed by the Burgos D (7), and the lowest h-index Seymour SL, Bradshaw R, Chan DW, Moritz RL, McGreal R, and Slotta D (4).

7. MAJOR FINDINGS

The present study reveals the primary published documents, yearly Average Citation, Author's Production, Author Collaboration, Citation Reference, Authors, Author's Countries, and h-index in the field of open education resources search output from 2785 records published during

the years 1992-2021 which is indexed in web of science database. Identified that the total output of open education resources research was increased throughout the year the significance of literature was increased over 30 years.

- ❖ 2021 is the greatest number of Articles in a productive year (389) and the 1993 lowest number of Articles productive year (5).
- ❖ The highest total citation per article was (91.15), and the lowest recorded total citation per article (4.40).
- ❖ The highest total citation per year was (4.98), and the lowest recorded total citation per year (0.15).
- ❖ 1992 is the greatest number of citable years (30) and the 2021 lowest number of citable years (1).
- ❖ Barnighausen T (1882) highest total citation, and Lee J (41) lowest.
- ❖ Barnighausen T (1882) had the highest total citation per year, and Lee J (41) had the lowest.
- Burgos D, Huang RH, Tlili A, Nascimbeni F, Bozkurt A, Kalz M authors Cluster is (1).
- The highest Betweenness Bozkurt A (4), and lowest Nascimbeni F, Kalz M, Thoma B, Chan TM, Anderson T, McGreal R, Hilton J, Wiley D, Fischer L, Burley SK, Zardecki C, Berman HM, Goodsell DS, Hermjakob H, Hunter C and Pandey A (0).
- ❖ Thoma B, Chan TM, Anderson T, and McGreal R highest Closeness (1).and Hermjakob H, Hunter C, and Pandey A (0.05) lowest.
- Huang RH, Tlili A authors first page rank (0.03033) and Burgos D (0.036051) authors last page rank.
- Burgos.d, Huang.rh, Rlili. A. The top journal that published the most papers on these references was Atkins.d 2007 rev.
- Wiley d 2014 ndb res ed communica P 781 and Po title captured author's elements
- Number of papers written by each author, Barnighausen, Kim, Pandey, Hermjakob, and Hunter, had the largest rectangles.
- Most Country authors were USA, as indicated by the size of the red rectangle, it also appeared that the USA authors almost published articles.
- The highest authors total publications were Burgos D (12), and the lowest were Seymour SL, Bradshaw R, Chan DW, Moritz RL, McGreal R, and Slotta D (4).
- ❖ The highest single authors' citation is Barnighausen T (1878), and the lowest is Tlili A (51).
- ❖ The highest total citation was Barnighausen T (1882), and the lowest was Tlili A (56).
- The highest h-index Thoma B (8), and the lowest was Seymour SL, Bradshaw R, Chan DW, Moritz RL, McGreal R, and Slotta D (4).

8. CONLUSION

This Scientometric study on 'Open Education Resources' research publications helps researchers, educators, policymakers, content developers, and end-users identify research trends. Due to the diversity of the 'Open Education Resources' research domain, there are ample opportunities to adopt collaborative efforts from researchers from various disciplines, such as educationists, technologists, behavioral analysts, social scientists, economists, psychiatric,

content developers, database managers, etc. Therefore, there is a need for more collaborative research and cooperation among researchers from various economic, cultural, and institutional backgrounds to anticipate excellent research on Open Education Resources for improved educational opportunities.

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Cite this article as: M.Muniyasamy and Dr.R.Jeyshankar (2022). Global Publications on Open Education Research: A Scientometric Analysis (1992-2021). International Journal of Emerging Knowledge Studies. 1(1), 24-29.