



## OUTCOME BASED EDUCATION: A BIBLIOMETRIC ANALYSIS FOR ASSESSING FUTURE TRENDS TOWARDS QUALITY EDUCATION

Amit Kumar Bhardwaj<sup>1</sup>, Seema Bawa<sup>2</sup>

<sup>1</sup>L M Thapar School of Management, Thapar Institute of Engineering & Technology Derabassi  
Campus, Mohali, India

<sup>2</sup>Computer Science & Engineering Department, Thapar Institute of Engineering & Technology,  
Patiala, India

Email id: [akbhardwaj@thapar.edu](mailto:akbhardwaj@thapar.edu)<sup>1</sup>, [seema@thapar.edu](mailto:seema@thapar.edu)<sup>2</sup>

doi: 10.48047/ecb/2023.12.si4.1171

---

Outcome-based education (OBE) is an approach that focuses on defining measurable learning outcomes and aligning instructional strategies and assessment methods to achieve those outcomes. OBE can help the world achieve its sustainable development goals (SDGs) by ensuring students develop the knowledge, skills, and competencies to address complex social and environmental challenges. This research article highlights the journey of the “Outcome-based education” discussion in worldwide research viz., past, present research affairs, and future. The present study also shows a bibliometric analysis of 238 records related to “Outcome-based education” by collecting the data from the Web of Science (WoS) from 1991 through 2022. The bibliometric results have shown year-wise publication trends, prominent publishers, most cited articles, most productive countries, prominent authors, and institutions. Further Netmap analysis done through VOSviewer software illustrates the growth of “Outcome based education” in the past, present, and future. Bibliometric and network analysis results from this research will significantly facilitate an understanding of the progress and trends for “Outcome-based education.”

---

### Introduction:

Higher education providers have long been focused on ensuring the employability of their graduates, as highlighted by several studies [16-18]. Nowadays, industry-integrated outcome-based education is at the forefront of higher education, aiming to enhance graduate employability. While graduates face challenges in entering the job market due to their limitations in applying their skills and knowledge in the workplace, higher education providers are also responsible for this issue [15-16] [19]. Therefore, universities must design courses that support graduates in achieving placements based on their skills, not just their degree. The course content must equip graduates with the necessary skills to become corporate ready-made employees that meet employers' needs in the dynamic job market of the 21st century. Outcome-based education learning is a way to address these challenges and ensure that graduate knowledgeable, confident and employable.

There is a significant body of literature on outcome-based education and graduate employability, including studies on work-integrated learning [17] [20-21]. These studies emphasize the importance of outcome-based learning in enhancing graduate employability by increasing their skill sets.

This literature review focuses on two types of learning objectives, namely outcome-based learning and work integrated learning, which share the common goal of enhancing graduate employability. It is worth noting that work integrated learning is also a form of outcome-based learning, as it involves

collaboration between students, academic supervisors, and industry to provide students with practical experience [23-24].

However, the literature on outcome-based learning and graduate employability is limited in terms of both prolific authors and dedicated journals in the field. Nonetheless, the findings suggest that outcome-based learning is a critical success factor for universities and educational institutions in achieving graduate employability. Fleming and Haigh [22] conducted a study that examined stakeholders' perspectives on work integrated learning using a triangular approach involving students, workplace supervisors, and academic supervisors.

The limited number of research articles on outcome-based education (OBE) is a concern. Most investigations focus on specific topics related to OBE, rather than examining the field as a whole from a systemic perspective. This is a significant limitation for scholars as it makes it difficult to identify important journals and articles, and to find suitable co-authors for collaboration on the latest information. In contrast, this paper provides a scientific analysis of the research prominence and trends in OBE to deliver relevant research. A recent comprehensive analysis of OBE [25] focused on presenting the field's development, identifying research gaps, and highlighting specific areas of research interest. However, this evaluation lacked a more comprehensive network exploration that is essential for identifying the most authoritative articles and meaningful clusters of research, more precisely and objectively.

To address this issue, we conducted a bibliometric examination of 238 records on OBE from 1991-2022. The aim of this research was to answer the following questions: (1) Year-wise production. (2) The most productive country and top-performing universities. (3) Various source journals and top contributing authors. (4) Most used keywords during the research.

The remainder of this study is structured as follows: The next section describes the research methods, followed by the results of the bibliometric analysis in the third section. The fourth section compares our proposed work with previous research, while the fifth section provides a discussion. Finally, the study concludes with a summary of its shortcomings and suggestions for future research in the sixth section.

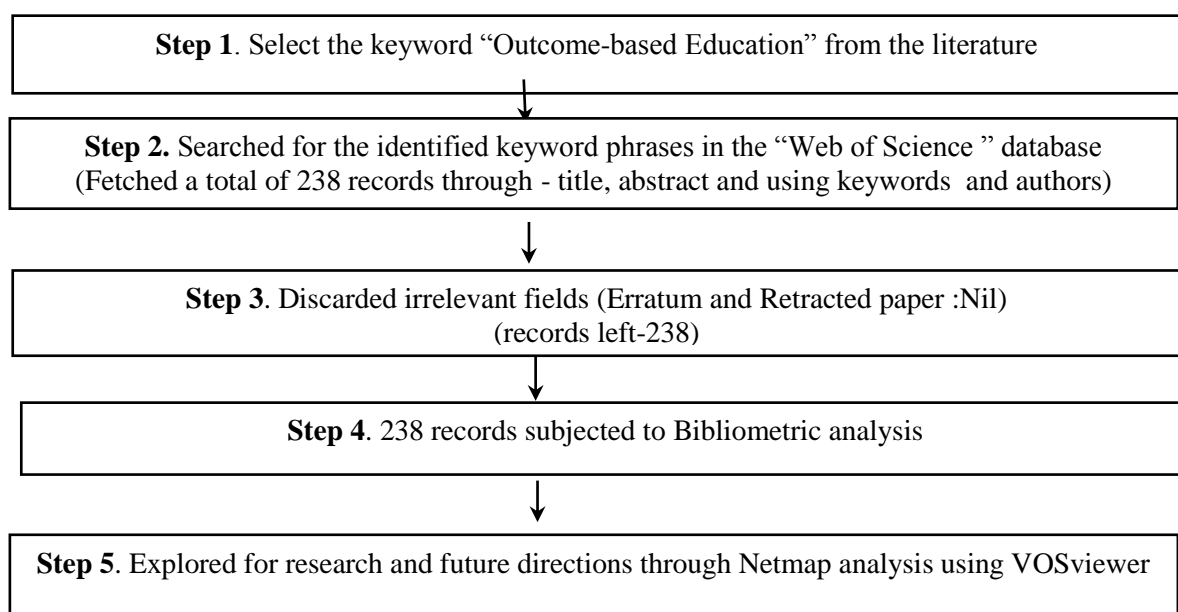
## 2. Methodology

The objectives of this research article to fulfill the following objectives:

1. To know who's who in "Outcome-based education" research
2. To understand the trends of "Outcome-based education" research
3. How future researchers can take the benefits from this bibliometrics analysis.

To fulfill the above mentioned objectives we have followed the given below methodology.

The research methodology involved two phases: data collection and bibliometric analysis. Firstly, scientific data was collected from various databases to identify important findings and potential research gaps, and a systematic literature review was conducted using proper search keywords [1]. As the number of articles increased, visualization tools were employed to conduct bibliometric analysis [2]. Figure 1 illustrates the steps taken in this assessment, which was based on a similar design used in previous research studies [8] [10-11]. The bibliometric analysis was conducted using the "Web of Science" database, managed by Clarivate Analytics. This database is the most extensive and includes numerous search databases that cover peer-reviewed journals, conference proceedings, and selected books. It is considered more comprehensive than other databases and captures the most reputed international journals. Clarivate Analytics's Web of Science (WoS) is widely used as a research tool and dataset for scientific citation search and analytical information platform across diverse knowledge domains, and has been used in thousands of published academic studies over the past two decades.



**Fig. 1** Data refining and analysis procedure

For the analysis, all scientific papers gathered from the database were selected and assessed using VOSviewer, a free bibliometric analysis tool available at [www.VOSviewer.com](http://www.VOSviewer.com), created by Nees Jan van Eck and Ludo Waltman [3]. VOSviewer stands out from other computer programs as it presents the data in a more advanced graphical format. The viewing capabilities of VOSviewer are well-suited for mapping large amounts of content [4].

### 2.1. Describing the suitable search term for Outcome based education.

The keyword phrase-wise numbers of records accessible from the Web of Science database are presented in Table 1. Earlier same study design already used by various researcher for their research work [8][12].

Table 1.

Keyword	Output through Web of Science 20212
'Outcome Based Education'	238

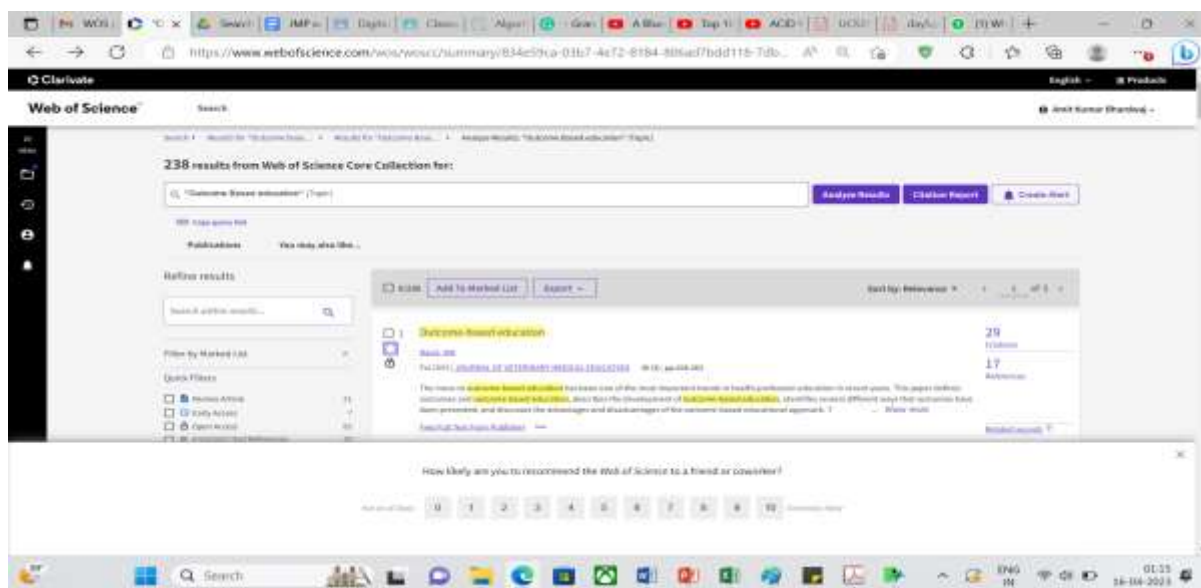


Figure 2. Query on Web of Science about “ outcome based education”

Figure 2. Mentioned that as soon you are searching the phrase “ outcome based education” on WoS it is showing the 238 articles by 16<sup>th</sup> April 2023.

## 2.2. Preliminary search outcomes

Table 2 presents the abstracts of journal articles, conference papers, books, and book chapters collected from the database using different keywords and titles. The WoS constraint and data selection settings are also shown in Table 2. This study design has already been employed by other researchers [9] [13-14], and we have adopted the same approach in our proposed research work based on their successful implementation.

**Table 2** The parametric constraint in VOSviewer and selection of data

Constraint Setting	
Duration	1991-2022
Terminology	title, abstract, author keywords and combination of keywords
Node type	Country, authors, cited journal, keywords, references
Retrieval approaches	
Search technique	Subject-oriented retrieval
Search interval	1989 -2021
Search term	“Outcome based education”
Database	Web of Science
Search result	238 records

## 3. Bibliometric Analysis Results

The aim of the bibliometric analysis is to investigate trends in publications, notable journals, authors, institutions, and countries using the MS-Excel tool [5-7]. Additionally, VOSviewer can be used to predict emerging models and techniques for OBE. It will also help us in to fulfill our all three objectives.

### 3.1 Year-wise Publications of Outcome Based Education

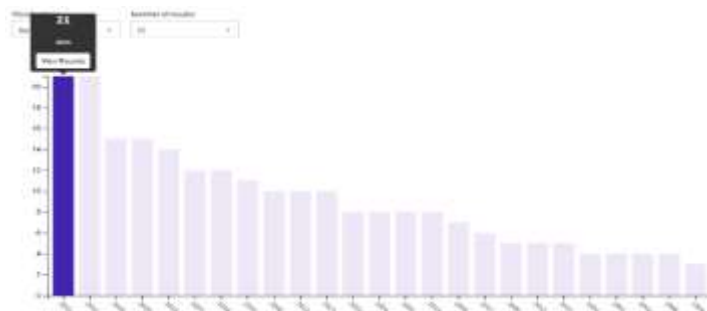


Figure 3. Year-wise Publications of the articles since 1991 to 2022 on OBE.

Figure 3 represents the publications of the OBE based articles year-wise since 1991 to 2022. The first article on OBE was published in 1991, initially there was very low frequency of publication but there is steady increase in the OBE centric publications recently. But still this domain is publishing very low number of articles as compare to other domains. It means there is high chance in the future where researchers will focus more.

### 3.2 Country-wise Publications in the domain of Outcome Based Education

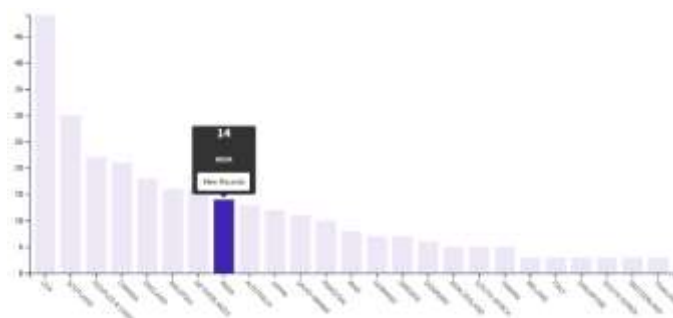


Figure 4. Country-wise Publications in the domain of OBE.

From the Figure 4. One can easily make out that USA is the number country which is contributing in OBE research articles publications and followed by the Scotland, China, Canada and England. India stands on 8<sup>th</sup> position with 14 number of research articles publications in the domain of OBE.

### 3.3 Contribution of the top Universities in the domain of Outcome Based Education



Figure 5. Top Universities in OBE publications

Figure 5 is about the OBE publication contribution by the academic institution. In this context University of Dundee ranked at 1<sup>st</sup> position with 24 articles contribution in the OBE research domain. Then University of Toronto is on 2<sup>nd</sup> position, whereas Karolinska Institute; and Maastricht University are sharing the 4<sup>th</sup> position together with 6 number of publications.

### 3.4 Contribution of the top Authors in the domain of Outcome Based Education



Figure 6. Top Authors of the Outcome based Education domain based on number of publications. Figure 6 represent the contribution of the top authors in the domain of outcome based education. Harden RM is an exceptional researcher in the OBE domain, as he contributed in 23 research articles. Davish MH occupied the 2<sup>nd</sup> position with 7 number of research articles and followed by Frank JR with 4 research articles on 3<sup>rd</sup> position.

**3.5 Where they are publishing:** This part of bibliometric analysis deals with the Web of science Categories, research area, top journals, top publishers, Document publication types; and indexing of these publications in the domain of Outcome Based Education. Figure 7 (a) presents the web of science categories and top categories are education scientific diploma (1<sup>st</sup> position), Healthcare science services (ranked 2<sup>nd</sup> position) and Education Educational research ranked 3<sup>rd</sup>. Whereas figure 7(b) represents the top research areas of OBE viz. Education Educational research on 1<sup>st</sup> position, Healthcare science services (2<sup>nd</sup> position) and Engineering on 3<sup>rd</sup> rank position.



Figure 7 (a). Web of Science Categories



Figure 7 (b). Top 10 Research area of OBE



Figure 7 (c). Top Journals/ Publication titles



Figure 7 (d). Top publishers

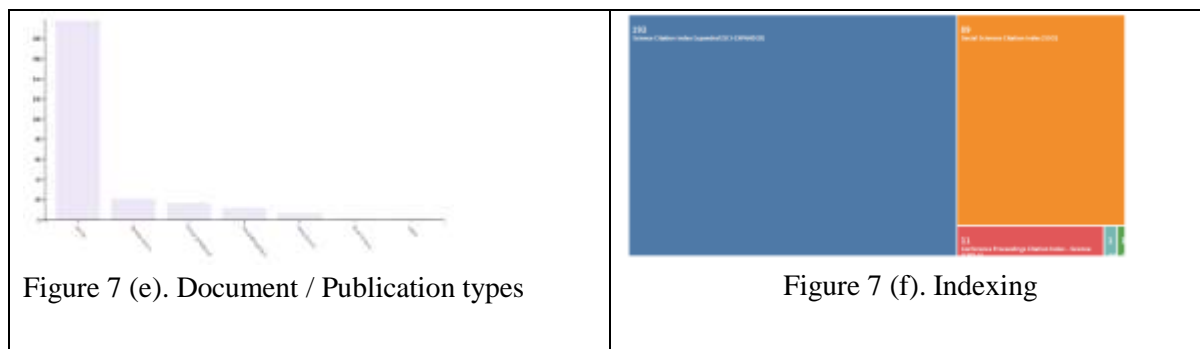


Figure 7 (c) presents the top journals in which OBE articles are getting published. Medical teacher ranked 1<sup>st</sup> and Medical education journal stands on 2<sup>nd</sup> position as a preference of the researchers for OBE domain. Figure 7 (d) presents the top publishers of OBE in which Taylor & Francis on 1<sup>st</sup> position, followed by Springer nature publisher and Wiley occupied the 3<sup>rd</sup> position. When we talk about the type of documents published then Figure 7 (e) justify the answer. It depicts the types of document / publication in which Journal article leading and followed by Review articles. Whereas the Figure 7(f) presents the Indexing of these publications. SCIE indexing is leading over SSCI as per the figure 7(f).

### 3.6 Keyword Analysis

For keyword analysis we have the JMP software for word cloud and sentiment analysis. Figure 8 depicts the subjectivity related OBE. As per this word cloud researchers are talking about the OBE , medical health, teaching, learning etc.



Figure 8. Word-cloud of the researcher's keyword, title and abstract.

### 3.7 Sentiment of the researchers on Outcome-based education:

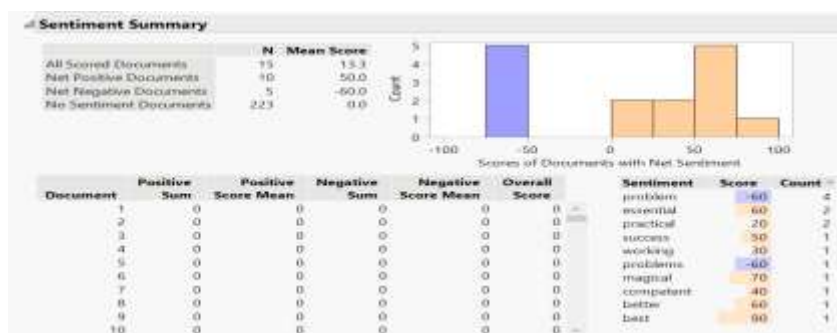


Figure 9. Sentiment analysis of researcher based upon their keyword, title and abstract Figure 9, depicts that OBE researcher are very positive as compare little negative.

### 3.8 Net-Map Analysis: Past, present and future of Outcome based education publications trends Analysis:

This section deals with the Net-map analysis of keyword used by the OBE researcher in WoS based upon 238 articles. We have used VOSviewer software. The concept of keyword abstraction was applied to comprehend the advancements in the field. According to the current investigation, various researchers extract keywords to evaluate the progress in the area. The VOSViewer software was used to generate subsequent records that determine the frequency of the keywords. Co-occurrence refers to the joint appearance of two keywords in an article [8]. The network employs different hues to depict the keywords and items in the same cluster represent the same subject matter. The most prevalent keyword among clusters defines the largest node of the cluster. The shift in colors across clusters signifies the study's gain. Figure 10 depicts a mean network diagram of author-supplied keywords' co-occurrence, utilizing the same research design employed by previous studies [8][13]. The Net-map consists of 104 items, seven clusters, 3,335 links, and a total network strength of 23,607. The keyword items are grouped into seven major nodes: Learning Outcome, Course, Level, Role, Medical education, Competency; and survey. Table 3 presents the total number of clusters and their respective keywords used in the network diagram.

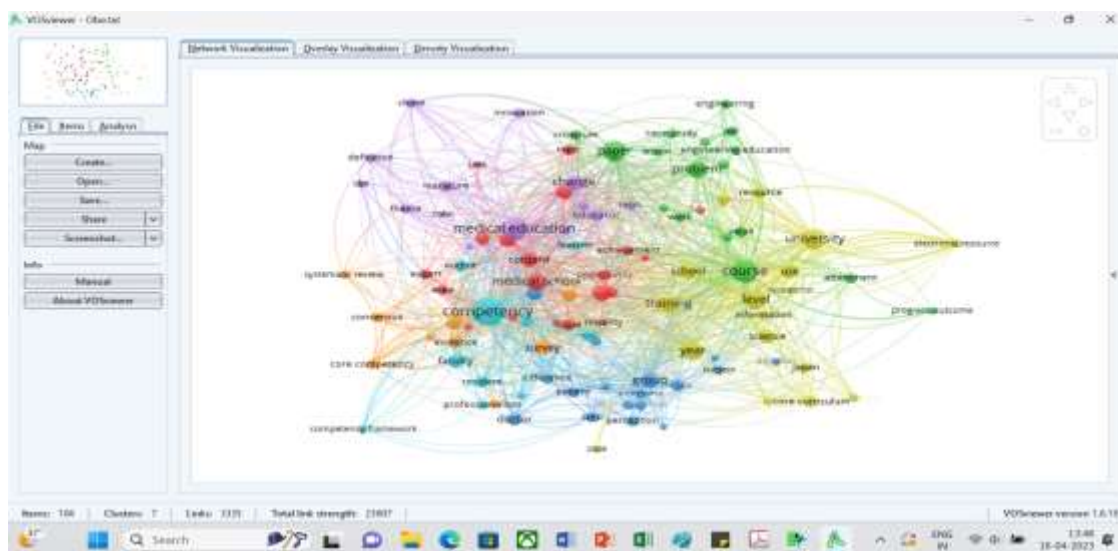


Figure 10. Net-Map Analysis of keywords of OBE articles

**Table 3.** Net- map analysis

Cluster No.	Top item name	Links	Strengths	Main items	Occurrences
1	Learning outcome	89	666	Learning outcome, Achievement, area, medical	51
2	Course	95	1391	Course, program outcome, accreditation, engineering	101
3	Role	93	660	Role, doctor, patient, medical student, perception, response, subject, score	42





The purpose of this research is to conduct a bibliometric analysis of 238 records on various aspects of current OBE research collected through the Web of Science. Although the research began slowly, it grew exponentially from 2016 to 2022. The United States contributed the most articles and citations in related publications, followed by Scotland, China, Canada, and England. India ranks 8th with 14 research articles in the domain of OBE. It was observed that the University of Dundee ranked first with 24 articles contributions in the OBE research domain, whereas the University of Toronto is second. Harden RM is an exceptional researcher in OBE as he contributed to 23 research articles. Davish MH occupied the second position with 7 research articles, followed by Frank JR with 4 research articles on the third position. The research also identified the top research areas of OBE, including Educational Research, Healthcare Science Services, and Engineering. Additionally, it discussed the top journals that accept OBE articles, with Medical Teacher ranked first and Medical Education Journal ranked second. Taylor & Francis is the top publisher of OBE articles compared to Springer Nature and Wiley. The researchers contributed more journal article documents than other types of documents. OBE researchers prefer SCIE-indexed journals over SSCI journals.

This research also presents the subjectivity and polarity of the researchers through word-cloud and sentiment analysis. The keywords under subjectivity are "outcome-based education," "medical health," "teaching," and "learning." OBE researchers have a very positive sentiment compared to negative sentiments. The research also discussed the Net-map of OBE articles, which consists of 104 items, seven clusters, 3,335 links, and a total network strength of 23,607. The keyword items are grouped into seven major nodes: Learning Outcome, Course, Level, Role, Medical Education, Competency, and Survey.

The article also mentions the trends of OBE-centric research. Initially (1991 to 2010), OBE research focused on medical education and medical school. Later on, OBE research shifted towards engineering education, science, core values, and competency frameworks during the period from 2016 to 2020. From 2020 onwards, it is more focused on program goals and attainment.

## **6. Conclusions, Shortcomings and Future Research**

To prevent losses resulting from Outcome-Based Education (OBE), more attention is needed. This article presents a research trend analysis of the past decade on OBE using VOSviewer software. A bibliometric study of 238 records from 1991 to 2022 was conducted to examine the annual production and citation, the most productive countries and organizations, source journals, top contributing authors, and keyword occurrence. The study provides answers to three key questions outlined in section one. Firstly, the number of articles related to OBE has increased over time. The United States is the most productive country in terms of published papers, indicating its role in promoting OBE research. The study highlights the most productive countries, journals, authors, and organizations, providing potential implications for researchers. Medical education is the most productive area in terms of publications and further research. In conclusion, the study identifies hot topics in OBE that have evolved over time, including appropriate theories, approaches, and applied techniques. The terminology used in the study is useful for researchers to understand the concept of OBE and enhance research in this field. However, the study has a few limitations. Firstly, the data is only from the Web of Science, and many studies on OBE may be published in other journals. Secondly, the study uses different terms for OBE, leading to overlapping explanations and approaches. Thirdly, the study only provides a snapshot of presently available data, while the field of research on OBE continues to evolve. Future bibliometric analyses may observe numerous journals and other available databases, such as Scopus, Google Scholar, and EBSCOhost, to provide a more comprehensive understanding of the field. This study helps researchers in several ways, including identifying the most reputable journals, countries, authors, articles, and keywords related to OBE for higher education. The net-map analysis provides insight into the growth of OBE in the past, present, and future.

**References:**

1. Saunders, M., Lewis, P., Thornhill, A., 2009. *Research Methods for Business Students*. Pearson, Harlow.
2. Hou, J.H., Yang, X.C., Chen, C.M. Emerging trends and new developments in information science a document co-citation analysis (2009–2016). *Scientometrics* 115(2), 869–892 (2018)
3. Van Eck, N. J., & Waltman, L. (2007a). VOS A new method for visualizing similarities between objects. In H.-J. Lenz & R. Decker (Eds.), *Advances in data analysis Proceedings of the 30th annual conference of the German Classification Society* (pp. 299–306). Heidelberg Springer.
4. Van Eck, N.J. and Waltman, L., 2010. Software survey VOSviewer , a computer program for bibliometric mapping. *scientometrics*, 84(2), pp.523-538.
5. Broadus, R. N. 1987. Toward a Definition of “Bibliometrics”. *Scientometrics* 12 (5–6)373–79.
6. Garfield, E., M. V. Malin, and H. Small. 1978. Citation data as science indicators. In *Toward a metric of science The advent of science indicators*, ed. E. Elkana, R. K. Joshua Lederberg.
7. Granzel, W. 2003. *Bibliometrics as a research field A course on theory and application of bibliometric indicators*. Course Handouts. Accessed March 21, 2020.
8. Bhardwaj, A.K., Garg, A., Ram, S., Gajpal, Y. and Zheng, C., 2020. Research Trends in Green Product for Environment: A Bibliometric Perspective. *International Journal of Environmental Research and Public Health*, 17(22), p.8469.
9. Wang, Z., Zhao, H. and Nie, H., 2020. Bibliometric Analysis of Rumor Propagation Research Through Web of Science from 1989 to 2019. *Journal of Statistical Physics*, 178(2), pp.532-55.
10. Ab Razak, M.F., Anuar, N.B., Salleh, R. and Firdaus, A., 2016. The rise of “malware”: Bibliometric analysis of malware study. *Journal of Network and Computer Applications*, 75, pp.58-76.
11. Maditati, D.R., Munim, Z.H., Schramm, H.J. and Kummer, S., 2018. A review of green supply chain management: From bibliometric analysis to a conceptual framework and future research directions. *Resources, Conservation and Recycling*, 139, pp.150-162.
12. Fahimnia, B., Sarkis, J. and Davarzani, H., 2015. Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics*, 162, pp.101-114.
13. Ding, Y., Wang, Y. and Wang, Y., 2021, August. It's Time to Confront Fake News and Rumors on Social Media: A Bibliometric Study Based on VOSviewer. In *2021 IEEE 4th International Conference on Computer and Communication Engineering Technology (CCET)* (pp. 226-232). IEEE.
14. Yunan, P., Zongshui, W. and Yueyang, F., 2020, August. Comparison of Research on Social Media in China and Foreign Countries Based on Bibliometric Analysis. In *Journal of Physics: Conference Series* (Vol. 1616, No. 1, p. 012066). IOP Publishing.
15. Ahmad, K., Zainal, N. F. A., & Rahmat, M. (2012). Relationship between employability and graduates’ skills. *International Business Management*, 6(4), 440–445. <https://doi.org/10.3923/ibm.2012.440.445>
16. Clarke, M. (2018). Rethinking graduate employability: The role of capital, individual attributes and context. *Studies in Higher Education*, 43(11), 1923–1937. <https://doi.org/10.1080/03075079.2017.1294152>

17. Jorre de St Jorre, T., & Oliver, B. (2018). Want students to engage? Contextualise graduate learning outcomes and assess for employability. *Higher Education Research and Development*, 37(1), 44–57. <https://doi.org/10.1080/07294360.2017.1339183>
18. Maxwell, R., & Armellini, A. (2019). Identity, employability and entrepreneurship: The ChANGE framework of graduate attributes. *Higher Education, Skills and Work-Based Learning*, 9(1), 76–91. <https://doi.org/10.1108/HESWBL-02-2018-0016>
19. Finch, D. J., Hamilton, L. K., Baldwin, R., & Zehner, M. (2013). An exploratory study of factors affecting undergraduate employability. *Education and Training*, 55(7), 681–704. <https://doi.org/10.1108/ET-07-2012-0077>
20. Arkoudis, S., & Doughney, L. (2016). Improving English language learning outcomes for international students in Australian Universities: Some critical issues. In C. Ng, R. Fox, & M. Nakano (Eds.), *Education in the Asia-Pacific region* (Vol. 33, pp. 297–314). Springer Nature.
21. Lloyd, M. G., & Griffiths, C. (2008). A review of the methods of delivering HE programmes in an FE college and an evaluation of the impact this will have on learning outcomes and student progression. *Journal of Further and Higher Education*, 32(1), 15–25. <https://doi.org/10.1080/03098770701765559>.
22. Fleming, J., & Haigh, N. J. (2017). Examining and challenging the intentions of work-integrated learning. *Higher Education, Skills and Work-Based Learning*, 7(2), 198–210. <https://doi.org/10.1108/HESWBL-01-2017-0003>
23. Raelin, J. A. (1997). A model of work-based learning. *Organization Science*, 8(6), 563–578.
24. Smith, C., & Worsfold, K. (2014). WIL curriculum design and student learning: A structural model of their effects on student satisfaction. *Studies in Higher Education*, 39(6), 1070–1084.
25. Raihan M.Z. and Azad Md. A.K. (2021), A Bibliometric Review on Outcome-Based Learning for Graduate Employability: Mapping the Research Front, *Journal of Education* ,1–19