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Blended Learning In Higher Education: A Bibliometric Analysis

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ABSTRACT

This study aims to identify and analyze main information, publication growth, the growth of this journal, growth by institution, research productivity, publications by country, publications by subject, publications by document type, thematic maps, network visualization, overlay visualization, density visualization, relationships between authors. The research used bibliometric method. Collecting data by searching through the Scopus database with the keywords Blended Learning in Higher education with the categories Article title, Abstract, Keywords in the period 2005-2021. Data were analyzed by year, author, origin of author and subject using Microsoft Excel 2010. Meanwhile, the publication development map was analyzed using R-Studio software, and VosViewer. The research results from this article itself found that the USA was the most contributing country regarding the topic of Blended Learning in Higher education with 16 documents and the most productive author on the topic of blended Learning in Higher Education was Najeh Alsalhi from Ajman University with 4 documents. Originality This study is the first to review and map the study of Blended Learning in Higher Education using bibliometric analysis, using data from year to year. All articles published in the journal have been reviewed in terms of methodology, country/country group of cases and topics/subtopics for future research.

Introduction

The discussion that is currently developing warmly in society in various fields is the industrial revolution 4.0 or known by other terms the digital revolution or the era of technological disruption. Industry 4.0 is present characterized by cyber-physical, people connect and communicate via the internet (Hermann, Pentek, and Otto 2016). As a result, to fulfill their dialy needs people switch to using technology such as online shopping, e-money, e-banking and online transportation. The world of higher education must not be crushed, it must be able to take advantage of it, and it must even be able to prepare itself to face the phenomenon of the industrial revolution 4.0. Minister of Research, Technology and Higher Education, higher education in Indonesia must make changes in the 'disruptive technology era' and play a role in filling the country's development (Aria and Cuccurullo 2017).

Ofcourse the answer is the learning process itself for the academic community to be able to take advantage of technology, information and communication. Then how is the learning? The Ministry of Research, Technology and Higher Education answers this challenge by implementing online learning to simplify the learning system. The E-Learning learning model in this study is a type of Blended E-Learning, where there will be face-to-face methods in the classroom as well as online lectures. Lecturers and students can take advantage of e-learning in the learning process, in the form of access to online materials, learning videos, online discussions, online assignments, and online exams.

Blended learning is widely recognized as the integration of face-to-face learning experiences in the classroom with online learning experiences. The increasing use of mixed learning environments in higher education has become an emerging trend in the twenty-first century (Mozelius, P., & Rydell 2017) due to the ever-changing world of technology and the need to guide twenty-first century learners to approach learning. Many studies have shown that blended learning can improve academic achievement (Kassab et al. 2015); (Kazu and Demirkol 2014). Through blended learning, technology is used to meet different learning styles or needs, engage students, and support learning goals and values.

In addition to the demands of the times, several studies have shown the positive impact of e-learning related to the learning process, learning outcomes, learning activity, and interest in learning (Allen and Jeff Seaman 2010); (W. S. Chen and Tat Yao 2016); (Du 2011); (Ford 2015); Fulton 2012; NCTM, 2000; (Owen and Dunham 2015); (Smith and Sawako Suzuki 2015). The use of ICT itself can shift from teacher-centered to student-centered which is the goal of the higher education curriculum.

However, despite the continued development of blended learning research, they have not provided adequate guidance to support the creation of immersive blended learning environments, which is seen as an important aspect of enhancing and contextualizing learning experiences for twenty-first century learners. Because providing immersive learning experiences is difficult because it is time consuming, expensive and difficult to assess (Beckem II and Watkins 2012), many professional educators have criticized the impersonal, sequential, and disconnected elements of current types of mixed learning models (i.e., rotational models, flexible, self-blend models, and enhanced virtual models), because they include fewer of the immersive elements of learning and teaching (Bidarra and Rusman 2017); (Lucke 2014); (Sobchenko 2021), although blended learning has emerged as one of the most dominant modes of delivery for various teaching contexts (R. H. Chen 2022), modern blended learning on the other hand should force the integration of immersive learning as it seems useful and needed in today's dynamic learning environment to shake learning for more excitement and innovation , and most importantly applicable and relevant to contemporary life and can be transferred to 'real world' situations (Bidarra and Rusman 2017).

This study aims to identify and analyze main information topics, publication growth, core journal growth, publication growth by institution, researcher productivity, publications by country, publications by subject, publications by document type, Thematics Maps, Network visualization, overlay visualization, density visualization, relationship between authors, dendogram maps, and trend growth of keywords.

Bibliometrics includes quantitative analysis of a particular publication or document, including author, subject, publication information, cited sources, and more. Bibliometric analysis can examine how scientific the communication process itself (Güzeller and Nuri 2018). Bibliometric studies make it possible to identify trends in a particular area (field of study) by measuring the literature in that area (Kasemodel et al. 2016).

Several bibliometric studies were conducted in various disciplines using more or less similar methods, such as economics (León-Gómez et al. 2021), social (León-Gómez et al. 2021),and education (Drajati et al. 2021). From this study, it is known that the study of Blended Learning in Higher education using biblimoteric analysis is still relatively small, especially in Indonesia.

Originality This study is the first to review and map the study of Blended Learning in Higher education using bibliometric analysis, using data from 2005 to 2021. All articles published in journals have been reviewed in terms of methodology, group of country/country cases and topics/subtopics for future research.

Method

This research uses the scientific method by taking five stages as shown in Figure 2 (Firdaus et al. 2019),namely: Stage 1 includes study design, research questions, keywords, and database selection. Phase 2, data collection is carried out using shortlisting criteria. Stage 3, after collecting data from the database, bibliometric analysis is carried out using biblioshiny, this is to help interpret the data (Jones and Gatrel 2014). Stage 4, analyzing the results and their interpretation accompanied by predictions of future research. Stage 5, this technique has high prestige in identifying research gaps and is the most recommended technique for synthesizing existing studies.

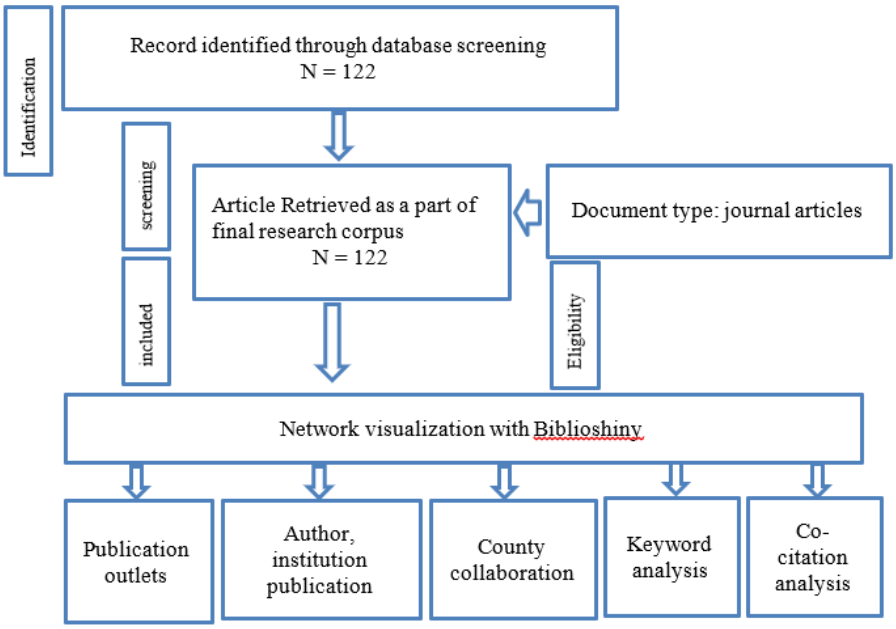

Figure 1. Process of Data Screening and Visualization

Database, Keywords and Inclusion Criteria

Data were extracted from the Scopus database, in October 2021 to reach the relevant information in this study. Scopus is best suited for bibliometric analysis and includes publications from top journals (Korom 2019). The data analyzed is the period 2005-2021 regarding Blended Learning in Higher Education. To facilitate a suitable search, the search term "Blend Learning in Higher Education" was used to search for keywords, abstracts and titles so that the initial results of 122 documents were obtained.

Results and Discussion

Publication and Citation Structure

The output is analyzed based on Scopus through VOSviewer, R Studio and Biblioshiny software to determine the most frequently occurring keywords. However, the number of keywords that appear most often is adjusted to the needs of data collection and analysis. VOSviewer is used to visualize bibliometric maps. This software displays bibliometric mapping on three different visualizations namely, network visualization, overlay visualization, and density visualization (Martínez-López et al. 2020).

The search results obtained 122 articles through the Scopus database. This data has been verified both in the Scopus database 2005-2021 with the keyword 'Blended Learning in Higher Education'. Obtained results with 3.1 citations/year, and 19.9/paper. The complete results of the comparison of metric data from the initial search and the refined search can be seen in Table 1.

Table 1. Core Information

Metric Data	
Source	**Blended Learning in Higher Education**
Publication year	2005-2021
Papers	122
Average years from publication	4.6
Cities/year	3.1
Cities/paper	19.9
h_index	20
Authors	294
Authors of single authored documents	18
Authors of multi authored documents	278
Collaboration index	2.8

Growth of Blended Learning in Higher Education Scientific Publications by Year

Blended Learning in Higher Education during the period 2005-2021 experienced a significant increase. Blended Learning in Higher Education which has the highest index on Scopus occurred in 2019 which reached 18 documents, and from year to year has an increasing trend because blended learning itself is closely related to technology that makes it easier for students to learn easily (Bizami, N. A., Tasir, Z., & Kew 2002). The complete growth of scientific publications in Blended Learning in Higher Education can be seen in Table 2 below. Table 2 Number of Blended Learning publications in universities.

Table 2. Number of Publications of Blended Learning in Higher Education

Publication Year	Total
2021	19
2020	15
2019	18
2018	10
2017	6
2016	5
2015	10
2014	5
2013	14
2012	7

Source: Biblioshiny (data processed)

The growth of Blended Learning in Higher Education publications based on table 2 and figure 2 shows that during the period 2005-2020 there was an increase and the highest growth

occurred in 2019 as many as 18 and in the following years, 2020 & 2021 also increased due to the need and implementation of blended learning at universities has increased due to the Covid-19 pandemic, so research on these topics will automatically increase because they are increasingly needed by institutions.

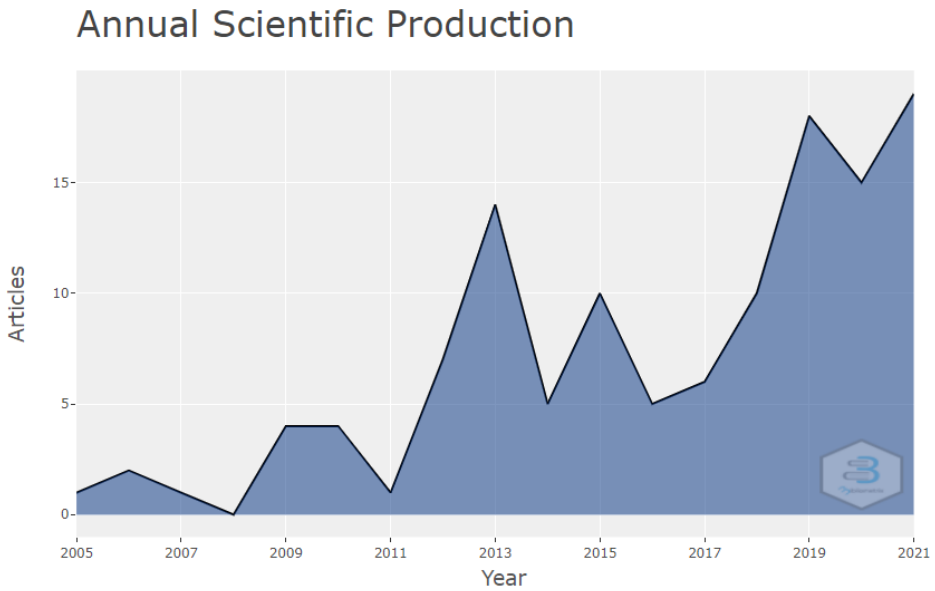

Figure 2. Number of Scientific Publications Blended Learning in Higher Education

Growth of core journals in scientific publications Blended Learning in Higher Education

From the search results with the keyword Blended Learning in Higher Education in the Scopus database, 122 documents were obtained. Of this number, the most publications of Blended Learning in Higher Education were published in the core journal Lecture Notes in Computer Science, namely 7 publications. Full details of the top 10 core journals that publish Blended Learning in Higher Education can be seen in Table 3 below.

Table 3. Core Journals in Scientific Publications Blended Learning in Higher Education

Core Journal	Number Of Documents
Lecture Notes In Computer Science (Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics)	7
Education and Information Technologies	5
Communications In Computer And Information Science	3
Computers And Education	3
International Journal Of Emerging Technologies In Learning	3
Internet And Higher Education	3
Blended Learning: Research Perspectives Volume 2	2
British Journal of Educational Technology	2
Education Sciences	2
Higher Education Research And Development	2

Source: Biblioshiny (data processed)

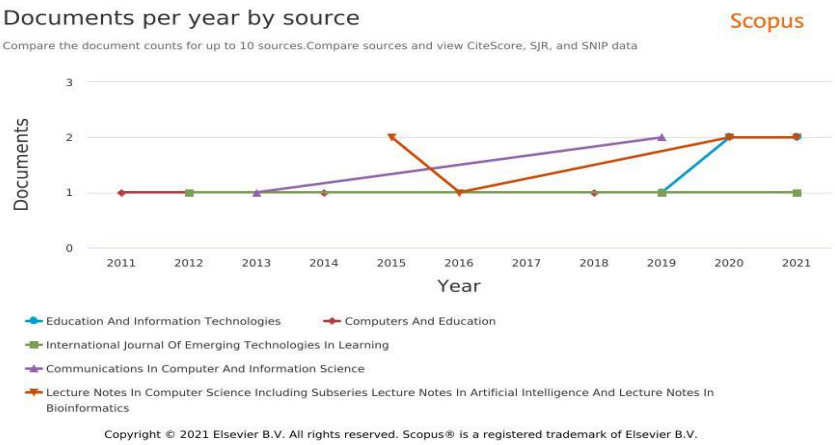

Figure 3. The Core Journal of Scientific Publications Blended Learning in Higher Education

Number of Citations for Blended Learning in Higher Education Scientific Publications Based on Citation

From the search results with the keyword Blended Learning in Higher Education in the Scopus database, 122 documents were obtained. Of this number, the most publications of Blended Learning in Higher Education are cited in the journal The Internet and Higher Education, with 163 citations, this data can help researchers who are interested in the topic to see sources that have a higher number of citations than other journals. In full, the top 10 journals that have been cited the most regarding Blended Learning in Higher Education can be seen in Table 4 and Figure 4 below.

Table 4. Number of Citations in Scientific Publications Blended Learning in Higher Education

Source	Number of Citation
The Internet and Higher Education	163
Computers & Education	151
British Journal of Educational Technology	68
Journal of Asynchronous Learning Network	39
Internet And Higher Education	30
Australasian Journal of Educational Technology	27
Education and Information Technologies	27
Computer Education	26
Handbook Of Blended Learning: Global Perspectives	26
International Journal On E-Learning	24

Source: Biblioshiny (data processed)

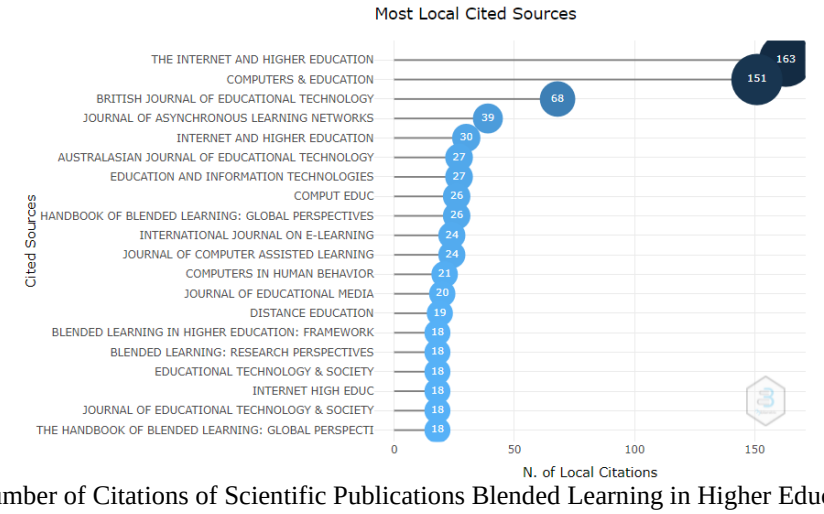

Figure 4. Number of Citations of Scientific Publications Blended Learning in Higher Education

Number of Blended Learning in Higher Education Scientific Publications by Affiliation /Institution

Data analysis shows that the most Blended Learning in Higher Education produced by Norges Teknikk-Naturvitenskapelige as many as 4 documents. Followed by Ajman University as many as 4 documents. The complete number of scientific publications on Blended Learning in Higher Education based on affiliation/institution can be seen in Table 5 below.

Table 5. The Number of Scientific Publications Blended Learning in Higher Education.

Institution/affiliate	Number of documents
Norges Teknikk-Naturvitenskapelige	4
Ajman University	4
Brigham Young University	3
Huazhong Normal University	3
Monash University	3
Universidad de Salamanca	3
Universidad de Granada	3
Center for Education and Innovation Research	2
Universiti Sains Malaysia	2
The George Washington University	2

Source: Scopus (processed data)

Viewed from Table 5 and Figure 4, it shows that of the 10 highest ranking institutions that contribute scientific publications to Blended Learning in Higher Education are Norges Teknikk-Naturvitenskapelige and Ajman University as many as 4 publications, therefore indicating that Norges Teknikk-Naturvitenskapelige University and Ajman University are institutions that most concerned with the topic of blended learning in higher education.

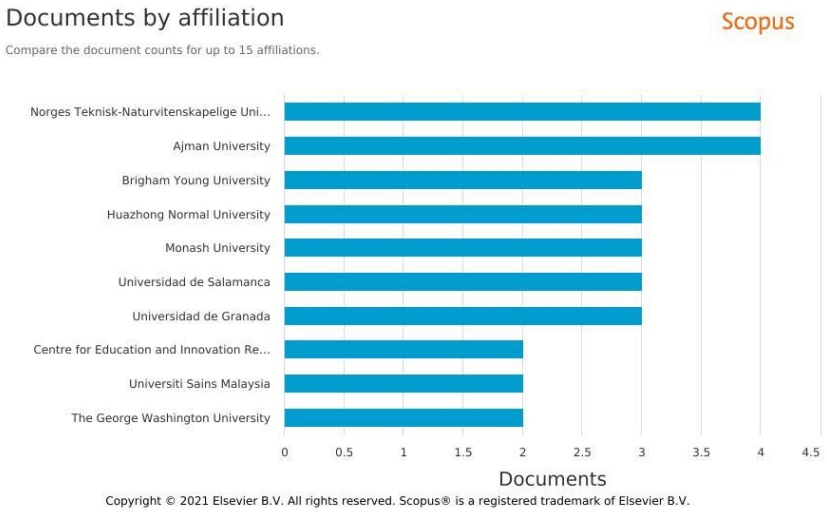

Figure 4. Number of Publications on Blended Learning in Higher Education Research Results by Affiliation/Institution.

Researcher Productivity

The most productive Blended Learning in Higher Education researcher is Najeh Alsalhi from Ajman University, followed by Ali Alammary from Monash University Australia, of all the authors who researched blended learning in higher education. Alsalhi has the best productivity than other writers who write with a similar topic. In full, the productivity of Blended Learning in Higher Education researchers can be seen in Table 6 and Figure 5.

Table 6. Researcher Productivity Blended Learning in Higher Education

Researcher	Number of documents
Alsalhi, NR	4
Alammary, A.	3
Carbone, A..	3
Eltahir, ME	3
Graham, CR	3
Martin-García, AV	3
Sheard, J.	3
Ahrens, A.	2
Al-Qatawneh, S.	2
Anthony Jr., B.	2

Source: Scopus (processed data)

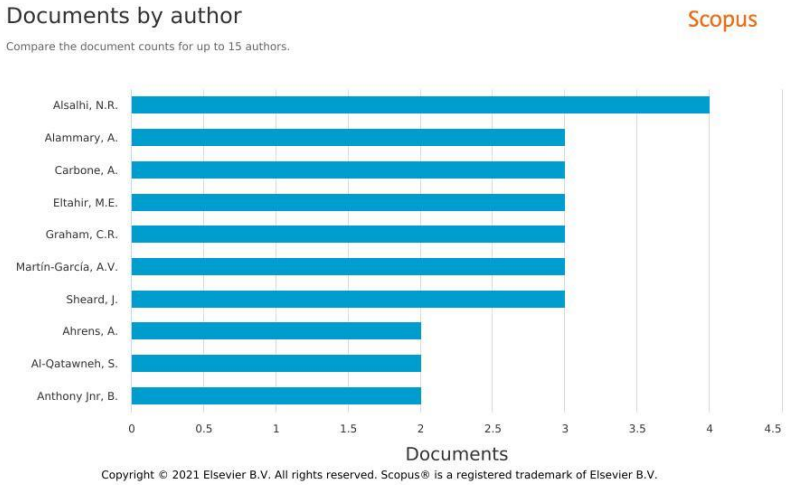

Figure 5. Productivity of Blended Learning in Higher Education writers

Number of Citations by Author

The Blended Learning in Higher Education researchers who were most cited were Acua Jo, Astudillo Mv, and Martn-Garca Av from Universidad de Salamanca with 17 citations, when viewed from the number of citations compared to the number of documents owned by the author, Acua Jo had more citations Alsalhi has the most documents, Acua Jo only has 1 scientific publication but has the highest number of citations than Alsalhi as the most prolific writer. The complete number of citations based on the authors of Blended Learning in Higher Education can be seen in Table 6 and Figure 5.

Table 7. Number of Citations by Author Blended Learning in Higher Education

Authors	Number of Citation
Acua Jo	17
Astudillo Mv	17
Martn-Garca Av	17
Cai J	10
Double N	10
Setiadi Pm	10
Wang X	10
Yang H	10
Yang H	10
Castro-Rodrguez Mm	10

Source: Biblioshiny (data processed)

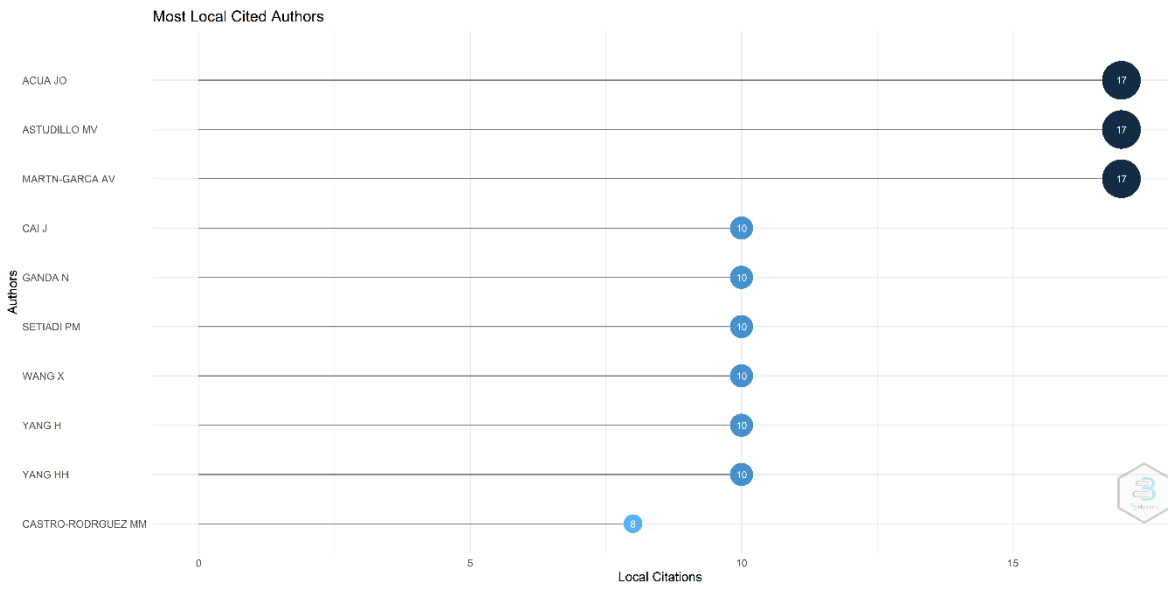

Figure 6. Number of Citations by Author Blended Learning in Higher Education

Number of publications by country

From the results of grouping by country, it shows that the United States of America is the highest country that contributes scientific publications to Blended Learning in Higher Education. Followed by Australia, China and in fourth place is occupied by Spain.

Table 8. Number of scientific publications on Blended Learning in Higher Education by country

Country	Number of Documents
USA	16
Australia	13
China	12
Spain	12
Malaysia	10
Belgium	9
Indonesia	9
United Kingdom	7
Canada	6
Tanzania	6

Source: Biblioshiny (data processed)

Table 8 and Figure 7 show that the most productive country in publishing Blended Learning in Higher Education scientific publications is the USA with 16 publications, although the most productive authors are from Australia, the distribution of authors regarding blended learning in higher education is better in America because it has the largest number of documents on the topic of any other country. Followed by Australia with 13 publications, followed by China with 12 publications and Spain with 12 publications.

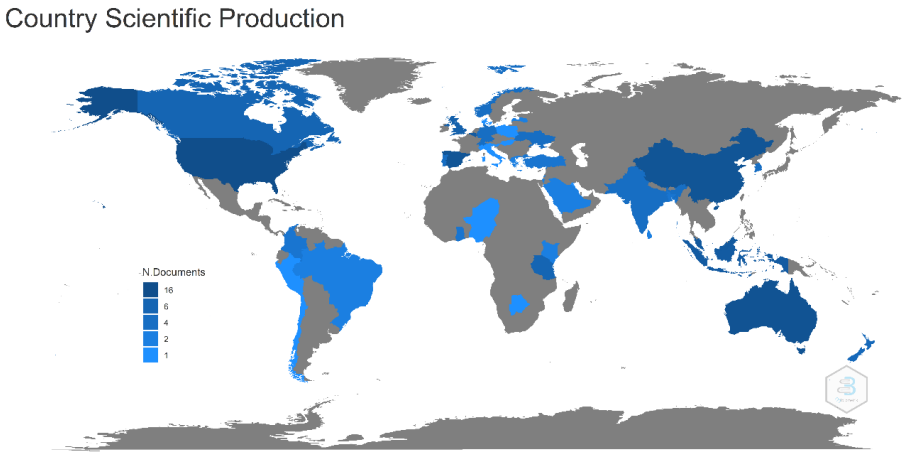

Figure 7. Distribution of the Number of Publications by Country

Number of publications by subject

Scientific publications Blended Learning in Higher Education shows that the most subject is Social Science, followed by Computer Science. The complete subject of Blended Learning in Higher Education scientific publications can be seen in Table 9 and Figure 8.

Table 9. Number of Scientific Publications Blended Learning in Higher Education

Subject	Number of Documents
Social Sciences	85
Computer Science	66
Engineering	12
Mathematics	10
Business, Management and Accounting	8
Decision Sciences	5
Multidisciplinary	3

Source: Scopus (processed data)

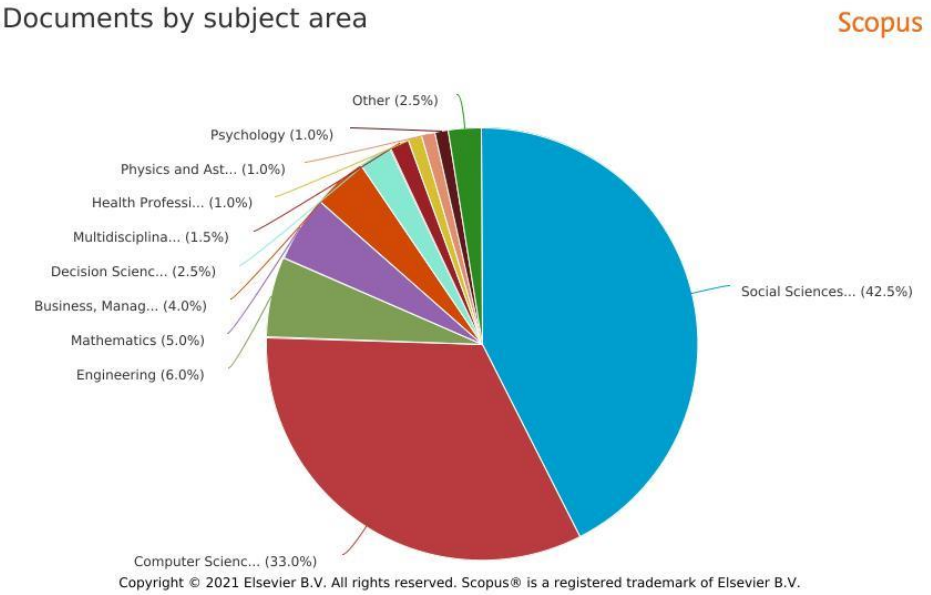

Figure 8. Number of Publications by Subject

The growth of Blended Learning in Higher Education publications by document type.

The search results show that the most scientific publications of Blended Learning in Higher Education are in the form of articles, followed by conference papers, book chapters

and reviews, but it can be seen from the data that it is the articles that are written by researchers the most compared to other documents. These data can indicate that researchers who write books and book chapters are still few and are needed for theoretical renewal. Complete scientific publications of Blended Learning in Higher Education based on document type can be seen in Table 10 and Figure 9.

Table 10. Scientific Publications of Blended Learning in Higher Education by Type of Document

Document Type	Number of Documents
Article	57
Conference Paper	35
Book Chapter	13
Review	9
Conference Review	5
Book	3

Source: Scopus (processed data)

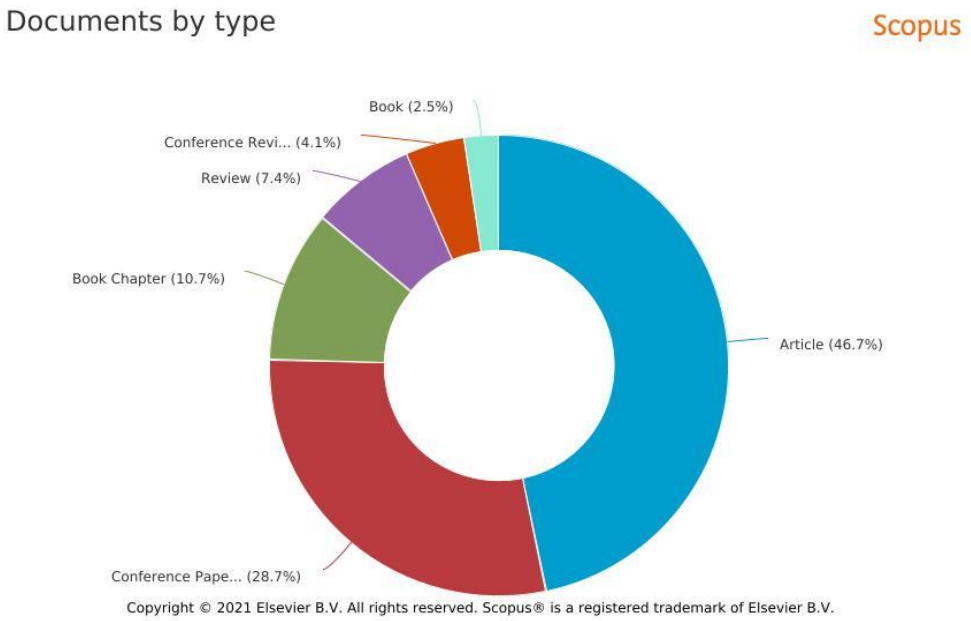

Figure 9. Growth of Scientific Publications by Document Type

Network Visualization, Overlay, Density on the Scopus Database

The data network visualization display on Scopus data related to Blended Learning in Higher Education keywords that have been refined in the search can be seen in Figure 10, overlay visualization can be seen in Figure 11, and dentity visualization in Figure 12.

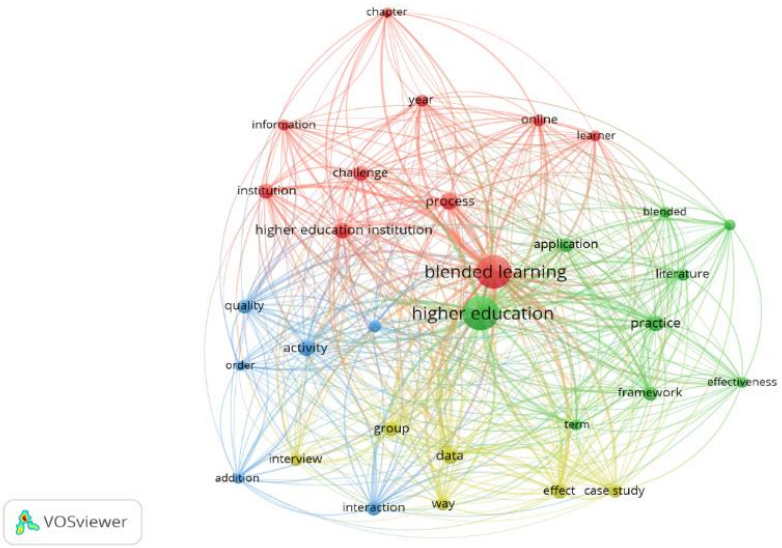

Figure 10. Network Visualization on the Scopus database

From the thematic map of network visualization, it can be seen that the topic of blended learning in higher education is related to related topics. teacher, or the effect of blended learning itself on student learning success.

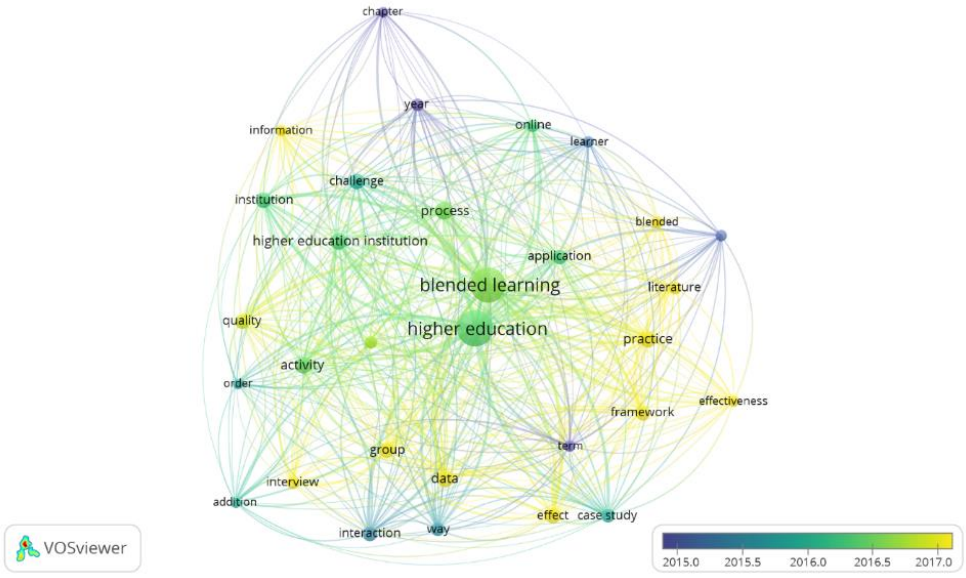

Figure 11. Visualization of overlay in the Scopus data base

From the thematic overlay visualization map, it can be seen that the blue line is the 2015 study, the green line is 2016 and the yellow line is 2017-2021. From the overlay map, it can be seen the trend of the relationship of various sub-topics to blended learning in higher education. Then the map can help the next author to determine what topics to take and which topics have not been related to blended learning for a long time.

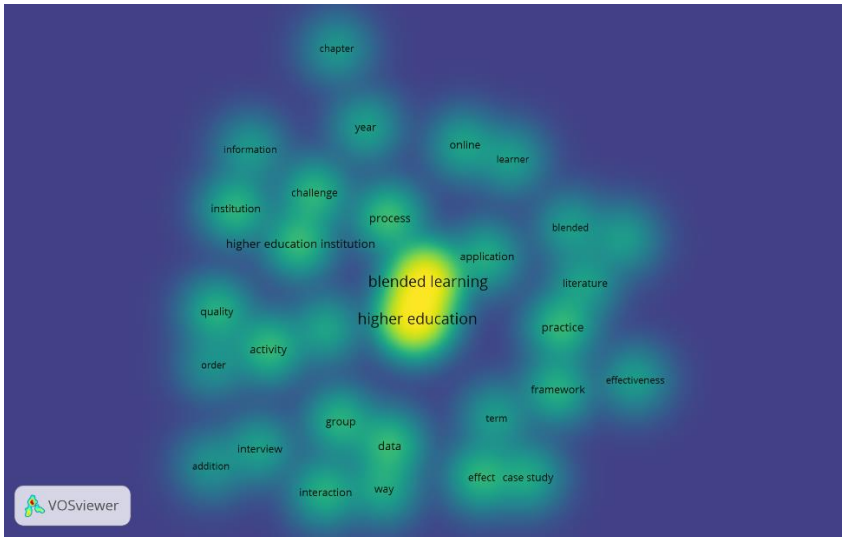

Figure 12. Density visualization in the Scopus data base

From the Density visualization image it can be seen that the thickest point is the topic that has been researched the most or has the strongest relationship with blended learning in higher education, therefore the image can illustrate for future researchers to choose a topic that has the most faded point, it will describe the up-to-dateness of the research to be carried out.

Conclusion

The growth of Blended Learning in Higher Education publications based on table 2 and figure 2 shows that during the period 2005-2020 there was an increase and the highest growth occurred in 2019 as many as 18. Most Blended Learning in Higher Education publications were published in the core journal Lecture Notes in Computer Science. namely as many as 7 publications. Full details of the top 10 core journals that publish Blended Learning in Higher Education can be seen in Table 3. Viewed from Table 4 and Figure 4, it shows that out of the 10 highest ranking institutions that contribute scientific publications to Blended Learning in Higher Education, 4 publications are Norges Teknikk-Naturvitenskapelige. The most productive Blended Learning in Higher Education researcher is Najeh Alsalhi from Ajman University, followed by Ali Alammary from Monash University Australia. In full, the productivity of Blended Learning in Higher Education researchers can be seen in Table 5 and Figure 5. From Table 6 and Figure 6 it shows that the most productive country in publishing Blended Learning in Higher Education scientific publications is the USA with 16 publications. Followed by Australia with 13 publications, followed by China with 12 publications and Spain with 12 publications. The search results show that the most scientific publications of Blended Learning in Higher Education are in the form of articles, followed by conference papers, book chapters and reviews.

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