

Students' Satisfaction in Blended Learning Environment—A Bibliometric Analysis

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ABSTRACT

The paper aims to study the trends and characteristics pertaining to satisfaction of students in a blended learning environment (BLE), exploring research publications covered in the Scopus database from 2004 to 2021 using the bibliometric analysis approach. The study identifies 376 documents from Scopus database relevant for the purpose of bibliometric analysis using Bibliometrix package of R and VOS viewer software to analyze annual productivity, most productive source titles, prolific countries, and eminent institutions. The findings revealed that 2019 and 2021 were the two most productive years for research on student satisfaction in BLE. The most productive countries in terms of contemporary research output are the USA, Australia, China & UK. USA, Turkey & Australia were the top three countries in citation analysis, USA & UK had the highest frequency of research collaboration. The most prolific journal for publishing work on student satisfaction in the BLE is Journal of Computers & Education. Finally, the Shiraz University of Medical Sciences of Iran was found to be the most productive institution. Findings will help the academicians to collaborate with other researchers based on the quality of research conducted by other institutes around the world.

Keywords: Student Satisfaction, Blended Learning Environment, Scopus, Bibliometric Analysis, Bibliometrix package of R and VOS viewer software.

INTRODUCTION

Education is at the core of mankind and the foundation of a prosperous society. Education is considerably more than just learning to read and write. The world is always changing, and this has an impact on a variety of professions including education. With the introduction of computers particularly the internet into the educational system a change from centralised classroom-based education to dispersed e-learning courses that can be accessed at any time and from any location has occurred (Alonso, López, Manrique & Viñes, 2005). The evolution of digital learning platforms has had a tremendous impact on educational institutions, resulting in new technology adoption. In this digital era, the previous technique of just sharing and receiving knowledge does not appear to be sufficient.

Practitioner Notes

What is already known about this topic

- Blended learning is the third generation of educational technology, and it has a big impact on the learning environment, as well as student satisfaction and motivation.
- In terms of improving students' attention, confidence, and satisfaction, blended learning surpassed pure online learning. Blended learning was perceived as having a higher level of satisfaction than face-to-face learning.
- Blended learning satisfaction has a direct and significant impact on performance.

What this paper adds

- The most fruitful years for research on student satisfaction in a blended learning setting were 2019 and 2021.
- In terms of modern research production, the United States of America, Australia, and China were the most prolific countries, whereas the United Kingdom, Spain, and Germany were the top three influential countries.
- The United States of America and the United Kingdom were found to have the most research collaborations.
- The most productive journals for publishing research on student satisfaction in a mixed learning setting were Computers & Education and The Internet and Higher Education.
- The most productive institution in terms of performing research on this topic was discovered to be Iran's Shiraz University of Medical Sciences.

Implications for practice and/or policy

- The conclusions of the bibliometric analysis can serve as the foundation for and a critical platform for further research in BL, as well as promote its widespread use in higher education. Studying current research trends on students' satisfaction in a blended learning environment, academics will be able to collaborate with other researchers based on the quality of research conducted by other institutes around the world.

So, with the widespread use of ICT tools and learning management systems (LMSs) in educational institutions and pedagogical practices, finding a pure traditional curriculum that does not incorporate any ICT aspects has become challenging (Diep,Zhu, Struyven, & Blicck, 2017). Thus, a blend of both traditional and technological learning approaches is the need of the hour. Blended learning is the third generation of distant learning (Staker, 2011), and it has a significant impact on the learning environment as well as student satisfaction and motivation. (Zhongheet *al.*, 2015).So,a blended method, which mixes self-paced learning, live e-learning, and face-to-face classroom learning, has been proven to be the most efficient teaching model by various authors (Alonso *et al.*, 2005). The students' experiences of acquiring reflective abilities were enriched by the blended learning design, which provided opportunities for them to reframe and reinterpret existing information, values, and beliefs (Cooner,2010). Students' satisfaction is one of the most important indicators of educational effectiveness irrespective of the manner—online, in a physical classroom, or in a blended environment—in which learning takes place. It is a crucial component in higher education; thereby a thorough research in this area can lead to improved student performance in their academic programmes, enhanced teaching techniques, and better student retention (Kintu, Zhu & Kagambe, 2017). This, therefore, calls for a good mapping of students' satisfaction in BLE in order to identify study trends and factors. Future researchers will benefit from a bibliometric analysis since it will serve as the finest platform for bringing together the brightest scholars, organizations, and countries engaged in this field of study.

METHODOLOGY

Systematic literature reviews, meta-analysis, bibliometric analysis, and content analysis are the different methods employed to conduct quantitative and qualitative literature reviews (Gaur & Kumar, 2018). This study employs a conjunction of bibliometric methods (Journal quality analysis, Authors and Affiliation analysis, Citation Analysis) methods to explore the search questions of this research on student satisfaction in BLE. Before going any further, it is imperative to provide a brief description of the above-mentioned methods. To define bibliometric methods precisely, it is designed to identify, describe, and analyze published research (Mazov, Gureev & Glinskikh, 2020). Using quantitative and transparent research review processes enhance the authenticity and reliability of the results, while also reducing the subjective bias of any kind of literature reviews (Maditati *et al.*, 2018; Zupic &Cater, 2015). Bibliometrics is a supportive tool for network analysis and co-occurrences to identify similar research themes. For data analysis and visualization, a handful of software are available in the arena of literature review: VOS viewer, Biblioshiny, Histcite, Bib Excel, Publish, and Gephi. Each of these software has different unique abilities and are limited by their own drawbacks (Persson *et al.*, 2009). VOS viewer can use Scopus, PubMed, and Web of Science as the databases, whereas Histcite considers its database from Web of Science only. Publish software accepts documents only from Google Scholar. Hence, the authors have applied the Bibliometrix package of R and VOS (Visualization of Similarities) software for bibliometric analysis on the literature of student satisfaction in BLE. Bibliometric techniques such as production analysis, citation analysis, co-occurrence analysis, keyword co-occurrences, co-citation analysis, etc. have been used for the analysis.

Data Extraction and Filtration

Every bibliometric analysis requires a database. The two most commonly used databases for bibliometric review are Scopus and Clarivate Analytics Web of Science (WoS) (Aria & Cuccurullo, 2017). The WoS covers 12000 journals which are only ISI Indexed, whereas Scopus includes 20000 peer-reviewed journals published in Elsevier, Emerald, Sage, Taylor & Francis, Springer, and Inderscience,hence authors chose to use Scopus database. As a result, the authors have chosen Scopus as their choice of database for reviewing student satisfaction in a blended learning environment. Further, Scopus is also a widely used database for mapping smaller research fields (Zupic &Cater, 2015), which is apt for mapping student satisfaction. Hence, for the analysis of data and basic visualization, authors have made use of the Bibliometrix package in R and VOS viewer version 1.6.17.

First, we performed the analysis of annual scientific production and publication outlet. After that, a co-citation analysis was done to develop the intellectual structure of the field and find the evolution of related literature (Elango, 2019). We adopted a two-stage process: data extraction followed by refining process as proposed by Alon *et al.*, 2018. In that, first, we developed a keyword search string to extract relevant documents from Scopus. We considered “Blended learning” or “blended education” or “hybrid leaning” or “flipped classroom” or “inverted classroom” or “mixed-mode instruction” or “Hy flex learning” and “student satisfaction” for our search. The initial search resulted in 388 documents. Since the documents extracted were from varied fields, a strict filtration process was required to select only the appropriate documents for this study.

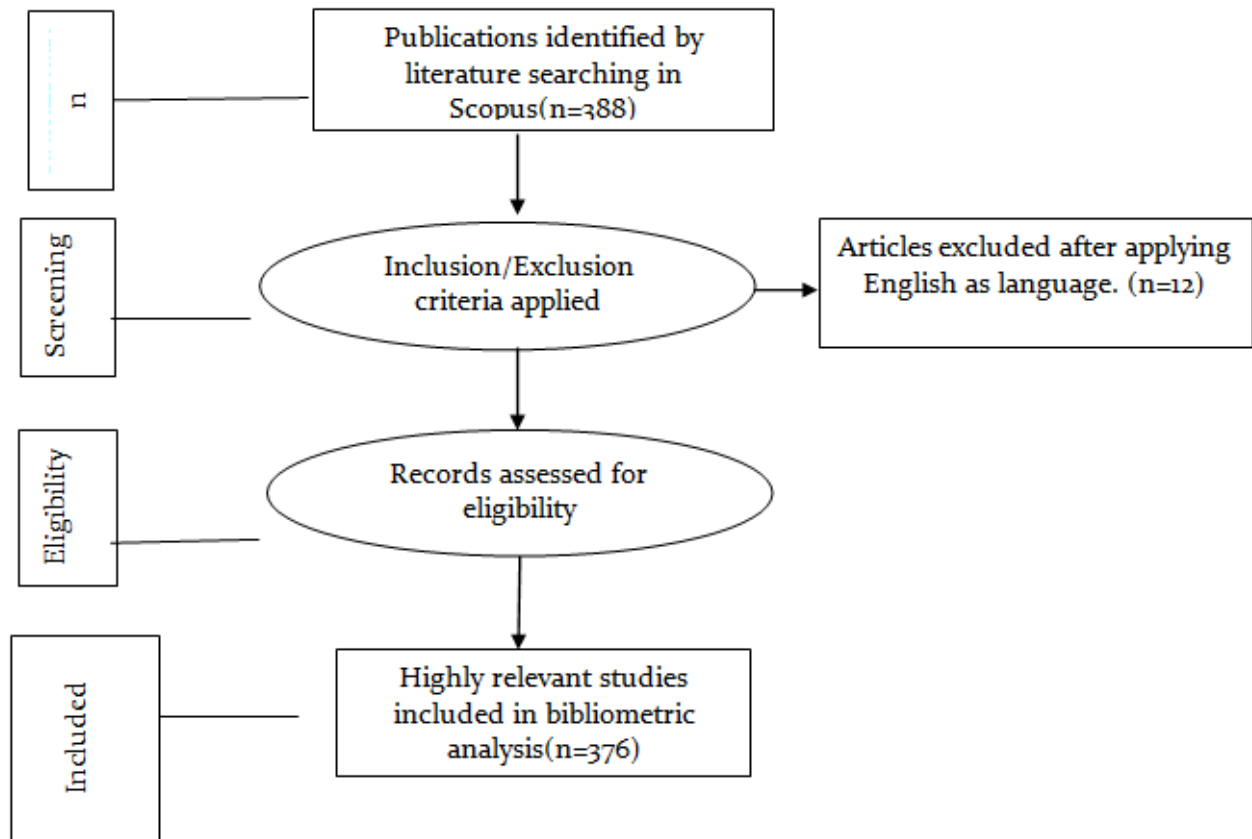


Fig. 1: Four-Phase Flow Chart of Data Extraction and Filtration

RESULTS

The preliminary search was attempted using the “Title, Abstract, Keywords” search criterion. The initial search resulted in 388 documents. Documents written in the English language were only ones to be selected to enhance the comprehensibility and readability. After filtration, only 376 documents were selected for second stage.

In the second stage, the abstracts and titles of the documents were thoroughly perused, to weed out the duplicates. Documents that were not appropriate for student satisfaction in a blended learning environment were also ignored. Finally, the total number of articles that were selected for this bibliometric study came to 376.

Descriptive Analysis

After a careful selection of documents, the main and descriptive information of all the selected articles were extracted. Table 1 reveals the findings, which are given as follows. Articles related to student satisfaction in a blended learning environment were included from 2004 onwards. A total of 260 journals were identified for the selected 376 articles. The average citation per document is 15.09 signifying the quality of every document selected.

Table 1: Descriptive Information of Articles of Students’ Satisfaction in Blended Learning Environment

Description Results	
Timespan	2004-2021
Sources (Journals, Books, etc)	260
Documents	376
Average years from publication	4.38
Average citations per documents	15.09
Average citations per year per document	2.566
References	11970

Source: Authors calculations

Annual Scientific Production of Articles

Figure 2 displays the chronological trend in the number of articles published in the field of students’ satisfaction in a blended learning environment since 2004. From the data, it is evident that the number of research articles pertaining to

our field of interest were nearly constant for few years till 2008, following which the number of research articles increased almost radically on year-to-year basis. The annual growth rate of articles was reported to be 21.39%. However, the number of articles published in the field of student satisfaction in a blended learning environment gained momentum in the period between 2016 and 2021.

Annual Scientific Production

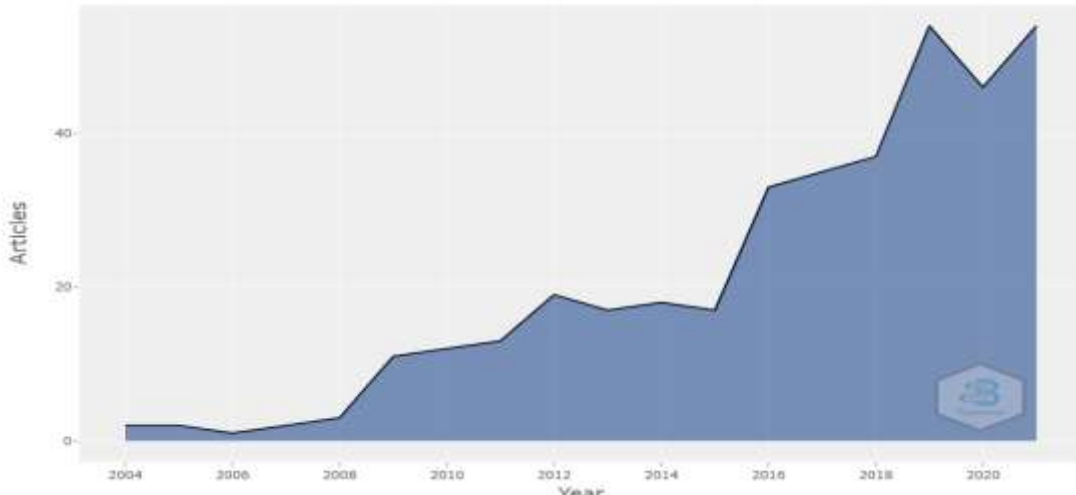


Fig. 2: Publication Trend in the Field of Students’ Satisfaction

Analysis of Journal Quality

The journals that publish the highest number of articles in a particular research field are regarded as “core journals” (Ali *et al.*, 2020). It is crucial to identify and assess the core journals for academics to know the scope of a particular field before conducting a literature review. Table 2 represents the contribution of the top 10 locally cited journals in the subject of student satisfaction in a blended learning environment. The table shows that *Computers & Education* (published by Elsevier) is the leading journal with a maximum publication of 287 articles.

Table 2: Top 10 Journals Publishing Research in the Field of Students’ Satisfaction in a Blended Learning Environment.

Source	Weblink/Publisher	Documents
<i>Computers & Education</i>	https://www.journals.elsevier.com/computers-and-education	287
<i>The Internet and Higher Education</i>	https://www.sciencedirect.com/journal/the-internet-and-higher-education	154
<i>Medical Teacher</i>	https://www.tandfonline.com/toc/imte20/current	106
<i>Academic Medicine</i>	https://journals.lww.com/academicmedicine/pages/default.aspx	99
<i>Medical Education</i>	https://onlinelibrary.wiley.com/journal/13652923	81
<i>Journal of Asynchronous Learning Networks</i>	https://publons.com/journal/10194/journal-of-asynchronous-learning-network/	70
<i>British Journal of Educational Technology</i>	https://bera-journals.onlinelibrary.wiley.com/hub/journal/14678535/forauthors.html	67
<i>BMC Medical Education</i>	https://bmcmmededuc.biomedcentral.com/	64
<i>Computers in Human Behaviour</i>	https://www.journals.elsevier.com/computers-in-human-behavior	63
<i>Journal of Dental Education</i>	https://onlinelibrary.wiley.com/journal/19307837	63

Source: Authors compilation

Production Analysis of Influential Countries

During the period of 2004-2021, 72 countries have published 376 articles on student satisfaction in BLE. Table 3 demonstrates the statistics of top countries publishing research in the field of student satisfaction. United States of America has published a total of 85 articles (22.6% of the total articles), followed by Australia (25), and China (25). United States of America with 2111 citations, Turkey with 579 citations, and Australia with 492 citations are the leading nations with respect to the number of citations. Figure 3 depicts the collaboration of countries for undertaking research in the current subject. It is evident from the data that United States of America and United Kingdom has the highest frequency of research collaborations, followed by Germany, China, and Australia. This signifies that developed nations are undertaking the most productive research in the concerned area of blended learning.

Table 3: Countries’ Publication and Citation Statistics

Country	Documents	Percentage of Total	Citations	Percentage of Total
United States of America	85	34	2111	48.61
Australia	25	10	492	11.33
China	25	10	80	1.84
United Kingdom	24	9.6	284	6.54
Spain	23	9.2	207	4.77
Germany	19	7.6	300	6.91
Turkey	14	5.6	579	13.33
Canada	13	5.2	168	3.87
Saudi Arabia	11	4.4	72	1.66
Malaysia	11	4.4	50	1.15

Source: The Authors

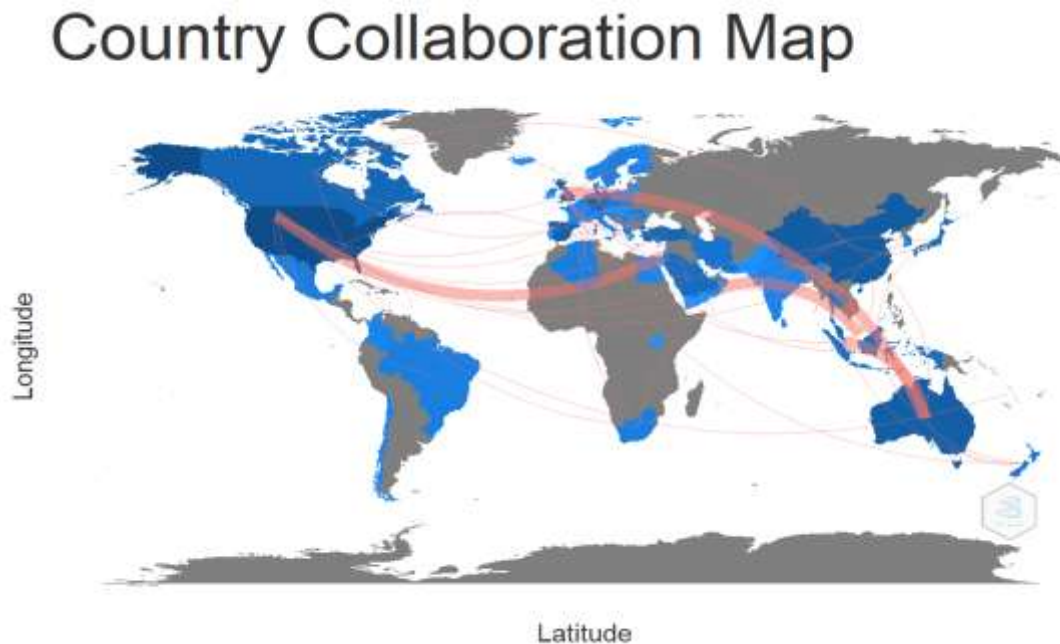


Fig. 3: The Country Collaboration Map for Students’ Satisfaction Research

Most Productive Institutions

A total of 381 organizations worldwide have contributed to the relevant research for scholarly publications. Table 4 depicts the statistics of the most productive organizations. Shiraz University of Medical Sciences, Iran is on the top with 15 articles. This is followed by Jena University Hospital, Germany with 10 articles. Other affiliations from United States of America, Japan, Singapore, and Saudi Arabia have conducted significant research on blended learning.

Table 4: Statistics of Most Influential Organizations Worldwide

Affiliations	No. of Articles	Percentage of Total
Shiraz University of Medical Sciences, Iran	15	15.63
Jena University Hospital, Germany	10	10.42
The George Washington University, Washington, D.C., United States	10	10.42
Tokushima University Graduate School, Japan	10	10.42
Isfahan University of Medical Sciences, Iran	9	9.38
National University of Singapore, Singapore	9	9.38
University Of Michigan Medical School, United States	9	9.38
Alfaisal University, Riyad, Saudi Arabia	8	8.33
Charité - Universitätsmedizin Berlin, Europe	8	8.33
Jagiellonian University Medical College, Poland	8	8.33

Source: The Authors

Citation Analysis

Citation analysis is used to determine which papers have received the most citations in a certain field of study. An article with the greatest number of citations is regarded as the most important in that study area. Citations are divided into two categories: global and local. Citations linked to an article without any filtration criteria, such as discipline, are referred to as global citations (Kent Baker *et al.*, 2020). The most cited article in terms of global citations is shown in Table 5. The article titled ‘Improvements from a flipped classroom may simply be the fruits of active learning’ has received the maximum number of citations (n=362). This is followed by ‘Flipping the classroom to improve student performance and satisfaction’ with a citation score of 327. In the highest cited paper, the author has tried to provide quantitative data about the effectiveness of the flipped classroom model. They concluded that student’s satisfaction is the same whether active flipped classroom model is adopted or active non flipped classroom model is adopted, while the learning gains is a result of the active learning style of the instructor. In the second most cited paper, the author concluded that improved learning can be achieved by combining innovative teaching tools with engaging classroom activities. However, this does not always lead to increased student satisfaction.

Table 5: Top 5 Globally Cited Articles in the Subject of Students Satisfaction in a Blended Learning Environment

Article Title	Author(s)	Journal	Total Citations	TC per year
Improvements from a Flipped Classroom May Simply Be the Fruits of Active Learning	(Jensen, Kummer and Godoy, 2015)	<i>CBE—Life Sciences Education</i>	362	45.25
Flipping the Classroom to Improve Student Performance and Satisfaction	(Missildine, Fountain, Summers and Gosselin, 2013)	<i>Journal of nursing education</i>	327	32.70
Multi-dimensional students’ evaluation of e-learning systems in the higher education context: An empirical investigation.	(Ozkan and Koseler, 2009)	<i>Computers and Education</i>	326	23.28
The evidence for ‘flipping out’: A systematic review of the flipped classroom in nursing education	(Betihavas, Bridgman, Kornhaber and Cross, 2016)	<i>Nurse Education Today</i>	236	33.71
A Blended Learning Approach to Course Design and Implementation	(Hoic-Bozic, Mornar and Boticki, 2009)	<i>IEEE transactions on education</i>	234	16.71

Source: Authors

Local citations come from the corpus of a certain field of study (Baker *et al.*, 2020). This implies that local citations are received from the study area of blended learning. From Table 6, it can be seen that an article by Missildine, Fountain, Summers, and Gosselin, ‘Flipping the classroom to improve student performance and satisfaction’ has received the

maximum citation score of 20. This is followed by ‘Evaluating student satisfaction with blended learning in a gender-segregated environment’ with a citation score of 12.

Table6: Top 5 Locally Cited Documents in the field of students’ satisfaction in the blended learning environment.

Article Title	Author(s)	Journal	Local Citations
Flipping the Classroom to Improve Student Performance and Satisfaction	(Missildine, Fountain, Summers, and Gosselin, 2013)	<i>Journal of Nursing Education</i>	20
Evaluating Student Satisfaction with Blended Learning in a Gender-Segregated Environment	(AbouNaaj, Nachouki, and Ankit, 2012)	<i>Journal of Information Technology Education</i>	12
The flipped classroom for medical students	(Morgan et al., 2015)	<i>The clinical teacher</i>	11
Improvements from a Flipped Classroom May Simply Be the Fruits of Active Learning	(Jensen, Kummer, and Godoy, 2015)	<i>CBE—Life Sciences Education</i>	10
Blended learning positively affects students’ satisfaction and the role of the tutor in the problem-based learning process: results of a mixed-method evaluation	(Woltering, Herrler, Spitzer, and Spreckelsen, 2009)	<i>Advances in Health Sciences Education</i>	9

Source: Authors

Co-Citation analysis

Co-citation refers to the number of times two articles are cited together in another document (Small, 1973). In bibliometric analysis, co-citation analysis is used to define an intellectual structure of a particular field (Rossetto *et al.*, 2018). It is also used for revealing the structure and trends of a search field. Two articles represented by one node seem to be connected to each other if they are cited together. This reveals that both the articles might be related to a similar subject matter (Hjorland, 2013). Our analysis shows that 63 of the total 378 articles are co-cited frequently in the other documents. Figure 4 depicts the co-citation network of references within the data set.

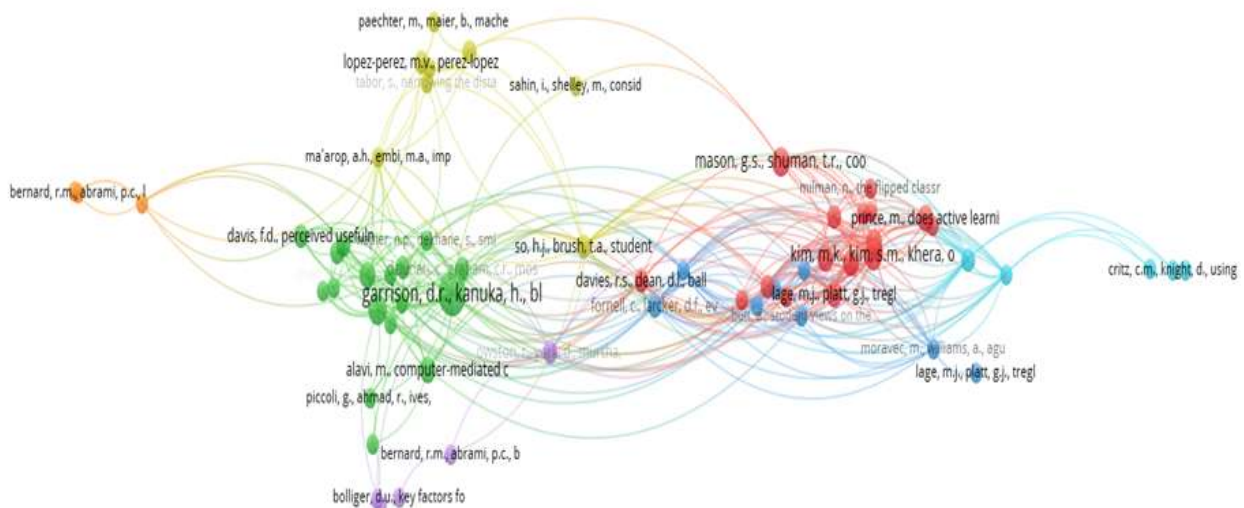


Fig. 4: Visualization of Co-Citation Analysis

Keywords Co-Occurrence Analysis

The rationale behind the analysis of keywords occurrence is that the authors’ keywords give a glimpse of the article content (Comerio & Strozzi, 2019). The co-occurrence of keywords occurs when two keywords are cited together in an article. This indicates that there exists a kind of relationship between two concepts. Scientometric researchers usually

The United States of America published 85 articles (22.6 percent of the total), followed by Australia (25), and China (25). With 2111 citations the United States of America, Turkey with 579 citations, and Australia with 492 citations are the top three countries in terms of citations. The United States of America and the United Kingdom have the highest frequency of research collaborations, followed by Germany, China, and Australia. This indicates majority of the research in the field of blended learning are happening in developed nations while the developing nations are presently lagging behind in this field.

Shiraz University of Medical Sciences of Iran is the most productive institution. This is followed by Jena University Hospital, Germany other affiliations are from the United States of America, Japan, Singapore, and Saudi Arabia which have conducted significant research on blended learning. The study of keyword co-occurrence shows that blended learning, students, student satisfaction and teaching learning are the most widely used keywords whereas learning environments, face to face instructions and technical presentation are those keywords which are unexplored but relevant for the blended learning research. By studying current research trends on students' satisfaction in a blended learning environment, academics will be able to collaborate with other researchers based on the quality of research conducted by other institutes around the world.

The conclusions of this bibliometric analysis can serve as a foundation for further research in BL and promote its widespread use in higher education. However, this bibliometric analysis provides a glimpse of research articles published on students' satisfaction in a blended learning environment from around the world. However, since the study was limited to the Scopus database, the findings cannot be generalized. It has not taken into account manuscripts from other databases or indexes, such as Web of Science, PubMed, and others. In order to attain generalizations, future studies will need to include papers from other databases also.

CONCLUSION

The papers published in Scopus between 2004 and 2021 pertaining to student satisfaction in a blended learning environment were confined to those connected to blended learning, and the keywords "blended learning" and "students' satisfaction" were made sure to appear in the titles, summaries, or keywords of these studies. The results were assessed under the headings of most productive journals, most productive nations, distribution of the most cited publications per year, collaborative country studies, bibliographic match, and word analysis. The current study shows that research on this field remained relatively stable from 2004 to 2008; however, the research in this area started gaining momentum and kept its pace afterwards. The findings reveal that 2019 and 2021 were the most productive years for research on student satisfaction in a blended learning environment. It was found that the United States of America, Australia, and China were the most productive countries in terms of modern research production, whereas the United Kingdom, Spain, and Germany were the top three influential countries. United States of America and United Kingdom proved to be the countries with the most frequent research collaborations. The journals *Computers & Education* and *The Internet and Higher Education* were the most productive publications for publishing research on student satisfaction in a blended learning environment. The Shiraz University of Medical Sciences, Iran was found to be the most productive institution in terms of conducting research on this topic. The limitation of the study is the fact that data was only gathered from Scopus, and it was examined using data analysis software, R-studio and VOS viewer.

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Statements on open data, ethics and conflict of interest

The data from the current study, in anonymized form, can be accessed from the authors' institution's webpage via a freely available login or password provided by the authors of this work upon request by the BJET. We confirm that all authors have read and approved the manuscript. We also confirm that the order of authorship has been agreed upon, and the criteria for authorship as outlined in the "Author Guidelines" section of the BJET have been met. This study has no conflicts of interest.

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