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Students' Views on Online Courses: A Bibliometric Study

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Abstract

This study presents a bibliometric analysis of research on students' perspectives regarding online courses. In this study, publication co-citation analysis, author co-citation analysis, and word frequency analysis methods were used to reveal the structure and transformation of online course literature. Descriptive data such as the distribution of studies in the field by country, institution, and time were obtained from 932 documents from the Web of Science (WoS) database. We used R and RStudio programs for bibliometric analysis. The analyses indicate the decisive role of American universities, researchers, and journals in this field, and the Bradford Law results support this finding. In the study, it was determined that the concepts of "knowledge," "education," "student," "online" and "perception" were frequently included among the concepts that stand out as the output of online course education. Especially with the Covid-19 pandemic, there has been a significant increase in studies on online course opinions and the number of individuals and organizations operating in this field. This situation shows that online education will be at the center of national and international studies in the future and will find a wider place in programs at every level of education.

Introduction

The rapid advancement of technology and digitalization has led to fundamental changes in the education sector. Online learning and distance education have gained prominence due to their flexibility, personalized learning opportunities, and broad access to digital materials (Moore et al., 2011). However, the effectiveness of online education is contingent upon proper planning and implementation, which directly impact student satisfaction and learning outcomes (Means et al., 2013).

With the onset of the COVID-19 pandemic, online education transitioned from an alternative learning method to a necessity (Hodges et al., 2020). This shift raised concerns about the quality of online learning environments, including student adaptation, technological infrastructure, pedagogical design, and instructional effectiveness (Bao, 2020). In this context, research on students' perceptions, satisfaction levels, challenges, and expectations regarding online courses is crucial for understanding the current state of online education and guiding future improvement efforts.

Students' perspectives on online courses generally encompass both positive aspects, such as ease of access, diversity of learning materials, and flexibility, as well as negative aspects, including lack of interaction, technical

issues, and loss of motivation (Martin & Bolliger, 2018). However, a significant portion of the existing literature focuses on the general aspects of online education, with less emphasis on students' individual experiences, social interactions, and emotional responses (Bond et al., 2021). This highlights the need for more comprehensive studies to gain a deeper understanding of students' experiences in online courses and to provide recommendations for improving these experiences.

Recent studies have also emphasized the role of student engagement in online learning environments (Kebritchi et al., 2017). Research suggests that gamification elements, such as leaderboards, achievement badges, and interactive storytelling, can enhance student motivation and retention in online learning environments (Deterding et al., 2011). Furthermore, cognitive load theory emphasizes the need for well-structured digital learning materials to prevent cognitive overload and improve comprehension in virtual classrooms (Sweller, 2010). Additionally, studies highlight that integrating collaborative tools, such as breakout rooms and shared documents, fosters a sense of community and enhances learning outcomes in online courses (Hrastinski, 2009). The effectiveness of online education is also closely tied to the design of interactive elements, such as discussion forums, virtual labs, and gamification, which have been shown to enhance motivation and learning retention (Sung et al., 2019). The integration of artificial intelligence and adaptive learning technologies has also been identified as a critical factor in improving personalized learning experiences and student outcomes (Zawacki-Richter et al., 2019). Research indicates that factors such as instructor presence, peer interaction, and multimedia integration significantly impact student engagement and learning outcomes (Richardson et al., 2017). Additionally, studies have explored the importance of self-regulated learning strategies in improving student success in online courses (Broadbent & Poon, 2015). Furthermore, socio-cognitive theories suggest that online learning environments should foster collaboration and active learning to enhance knowledge retention and motivation (Bandura, 1997).

The present study aims to bridge this gap by conducting a bibliometric analysis of research related to students' perspectives on online courses. By identifying key themes, trends, and influential contributions in the field, this study provides valuable insights into the current landscape of online education research and highlights potential directions for future investigations. The bibliometric approach enables a systematic exploration of how research in this domain has evolved over time, which factors have influenced its development, and where gaps remain in the literature. Bibliometric analysis is an effective method for revealing the global distribution of publications, collaboration networks, thematic shifts, and relationships among key concepts in a specific research field (Van Eck & Waltman, 2010). In this context, the study will analyze the overall academic research landscape on students' experiences and perceptions of online courses, highlighting prominent themes, international collaborations, and research gaps in this area. The findings will provide theoretical and practical contributions to improve the design and implementation of online courses.

Accordingly, the research focuses on the following questions:

- (1) What are the most influential journals on online courses?
- (2) Who are the most influential authors in online course research?
- (3) Which universities and countries contribute the most to online course research?
- (4) What is the citation impact of studies on online education?

- (5) What are the key terms and emerging trends in online course research?
- (6) How do author collaborations form clusters in online education research?

The study's findings aim to contribute to the development of student-centered approaches in online education and provide valuable insights to guide future research in the field.

Method

In this study, publication co-citation analysis, author co-citation analysis and word frequency analysis methods were used to reveal the structure and transformation of ONLINE COURSE literature. Descriptive data such as the distribution of studies in the field by country, institution and time were obtained from the Web of Science (WoS) database. RStudio program was used for bibliometric analysis.

Data Collection

In this study, we used the WoS database to obtain the bibliometric data examined. The WoS database is considered the world's leading academic database with the abundance and diversity of the publications it scans (Pranckutė, 2021). In addition to this feature, the WoS database also provides the distribution of bibliometric data of the publications it scans according to countries, scientific fields, journals, etc. It also provides basic statistics. In this study, our search query is "STUDENTS' ONLINE COURSE OPINIONS".

Following the search, we applied filters specific to the "Education" and "Educational Research" categories within WoS. We further refined the search by selecting "Articles" as the document type and including only articles indexed in SSCI, SCI-Expanded, and ESCI. This process yielded a total of 932 articles. The BibTeX entries for these articles were downloaded in the "Full Record" format from WoS. Since WoS allows for the download of a maximum of 500 results in BibTeX format per query, the metadata collection consisted of two separate BibTeX files. These files were subsequently merged using the Latex Bib File Merger tool.

Data Analysis

Bibliometrics is a quantitative analysis of the bibliographic features of academic literature (Donthu et al., 2021). It helps reveal the structure and development of research fields by analyzing relevant publications (Jusoh et al., 2021). The method is widely used to determine research trends and current status through systematic analysis (Todeschini & Baccini, 2016).

In this study, bibliometric calculations were conducted using R and RStudio to provide clear and interpretable visualizations of research patterns. Metrics such as citation impact, h-index, and g-index were computed. Figures and tables were used to enhance the readability of the results. Descriptive statistics, including the distribution of articles across journals, authors, and institutions, were also examined to gain a deeper understanding of the landscape of online course research. Descriptive information about the obtained data is given in Table 1.

Table 1. Descriptive Information

Description Results	
MAIN INFORMATION ABOUT DATA	
Timespan	2002:2024
Sources (Journals, Books, etc)	587
Documents	932
Annual Growth Rate %	20,08
Document Average Age	6.06
Average citations per doc	8.652
References	26009
DOCUMENT CONTENTS	
Keywords Plus (ID)	765
Author's Keywords (DE)	2710
AUTHORS	
Authors	3097
Authors of single-authored docs	168
AUTHORS COLLABORATION	
Single-authored docs	174
Co-Authors per Doc	3.53
International co-authorships %	12.12
DOCUMENT TYPES	
Article	598
Article; book chapter	8
Article; early access	14
Article; early access; retracted publication	1
Article; proceedings paper	2
Article; retracted publication	3
Editorial material	1
Proceedings paper	293
Review	12

The data in Table 1 show that the research on online courses has shown a remarkable annual growth rate of 20.08% in a 22-year period covering the years 2002-2024, indicating that the interest in this field is rapidly increasing. The use of a total of 932 documents and 587 different sources (journals, books, etc.) shows the diversity and breadth of the literature in the field. The average document age of 6.06 years indicates that the research is based on relatively new and current trends, while the average number of citations of 8.652 shows that the publications have an impressive scientific impact. The use of a total of 26,009 references indicates that the literature has been evaluated comprehensively. The presence of 2,710 keywords under the title "Author's Keywords" (DE) and the use of 765 keywords under the title "Keywords Plus" (ID) show that the studies cover a wide range of research topics and conceptual frameworks. This reflects the wide range and different research approaches in the subject

of online courses.

The 3,097 authors contributing to the studies and the collaborations with an average of 3.53 authors show that the field is highly collaborative. The international co-authorship rate of 12.12% reveals that there is a global interest and contributions to interdisciplinary studies. The relatively low number of single-authored studies (174 documents by 168 authors) indicates that the subject is mostly a field that requires a collective effort. The studies, mostly published in article format (n: 598), provide an idea about the quality of research in this field. 293 conference proceedings show that online education research is a rapidly developing and applied field. In addition, the presence of 12 review articles shows that comprehensive analyses of specific topics are made in this field and that compilation studies are important. Figure 1 shows the annual scientific productivity.

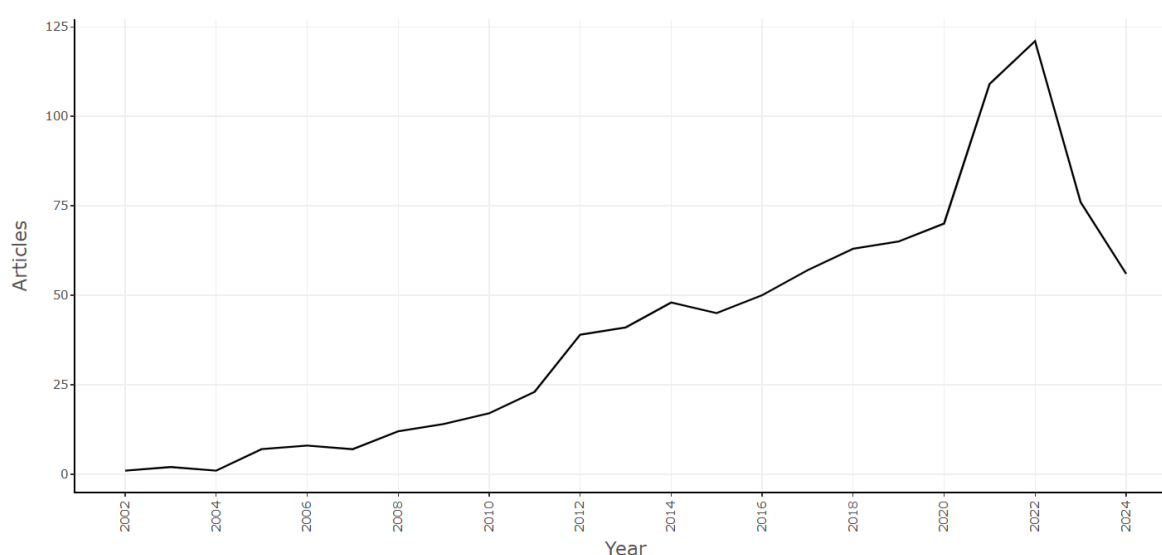


Figure 1. Annual Number of Studies

Author and publication co-citation analyses were performed on these data, and all citations were included in the co-citation analysis. This resulted in scattered and difficult-to-interpret images. For this reason, analyses were limited to publications exceeding a certain threshold value (White & McCain, 1998). There is no definitive judgment in the literature on what this threshold value should be and how many words should be included in the analysis (Özçınar, 2015). In this study, the most cited publications according to h and g-indexes were included. The h_index calculation is based on a scientist's most cited articles and the number of citations they receive in other publications (Sparkes, 2021). The g-index created by Egghe (2006) defines publications that receive g2 or more citations. For example, if the total number of citations received by the top 10 publications (g) in the selected period is more than 100 and the total number of citations (g2) is less than 121 when the eleventh publication is included, the g value for this period is determined as 10.

The standard citation analysis method is based on the idea that citations can be used as abstract symbols related to the research topic, process or theoretical perspective (Small, 1978). Based on this, the clusters obtained in co-citation analysis reflect the intellectual and cognitive structure of the field of study (McCain, 1990). The cluster analysis method can be performed on the scale of publication, author or journal. In this method, the number of

times two publications, authors or journals appear together in the bibliography of third publications is accepted as a measure of the similarity of the theoretical perspectives, research topics or methods of these publications, authors or journals. For example, if publications A and B are cited in publications X, Y and Z, the number of co-citations of A and B is 3. This situation is interpreted as the authors of publications X, Y and Z think that publications A and B are similar in certain areas. One of the aims of co-citation analysis studies is to examine the change in the structure of the research field. This method is applied by dividing the period in which the research area is examined into equal parts, creating a co-citation network for each sub-time period, and integrating these networks. Comparing the standard citation networks created for successive time periods allows us to identify change and transformation points in the field. In this study, the change in the field was determined by comparing the co-citation network with the RStudio program.

When the number of studies is examined on an annual basis according to Figure 1, it is striking that there has been a general upward trend and a significant increase since 2020. It is seen that the number of publications reached its peak in 2021 in particular. The increase in this period may be related to the COVID-19 pandemic causing a forced transition to online learning in education systems. In the years following the pandemic, especially in 2023 and 2024, a decrease in the number of publications is observed; this suggests that the research focus has begun to shift to other areas with the normalization process or that the subject of online education has reached a certain saturation.

Results

Annual Citation Count

The annual citation count of academic studies on online courses is presented in Figure 2.

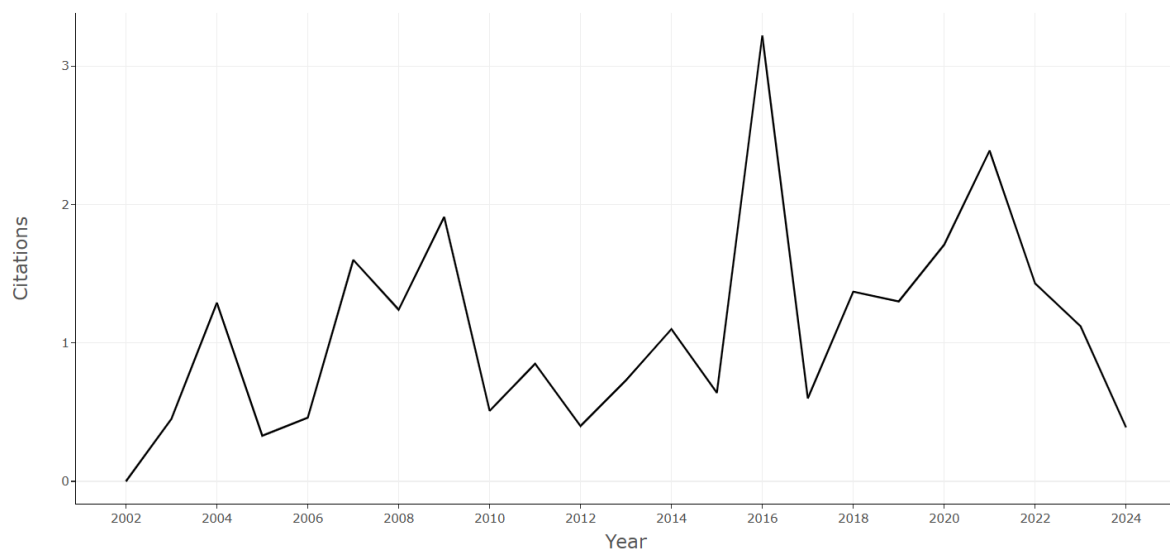


Figure 2. Annual Citation Count

According to Figure 2, while high average citation numbers were notable in 2007, 2009 and 2016, a general increasing trend was observed especially in the period after 2016. With the increasing importance of online courses during the COVID-19 pandemic (2020-2021), the studies published during this period received intense interest

from academic circles and reached high citation rates. The fact that the average number of citations increased to 2.39 in 2021 reveals the impact of the pandemic on academic research in this field. However, a decrease was observed in the average number of citations as of 2022; the fact that these rates remained low, especially in 2023 and 2024, suggests that the published studies have not yet created a sufficiently widespread impact or that academic interest in online courses has begun to decrease. In general, the findings indicate that academic interest in online courses has a dynamic course, has been significantly affected by social events such as the COVID-19 pandemic, and that this interest may be decreasing as of 2022.

Tre Field Plot

Tre field plot of academic studies on online courses is presented in Figure 3.

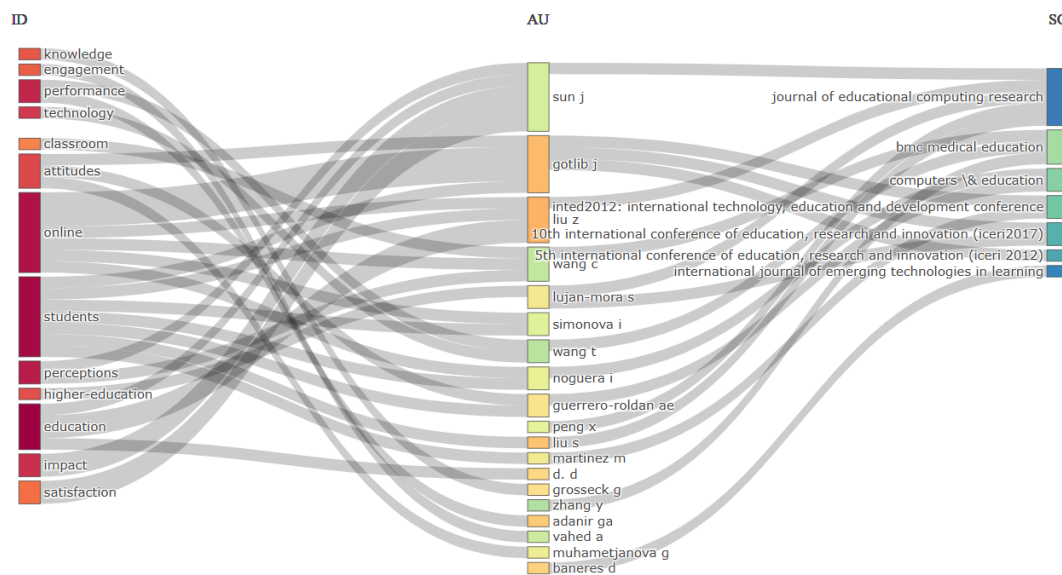


Figure 3. Tre Field Plot

Figure 3 visualizes the structure of research in the field of online education by visualizing the relationships between keywords (ID), authors (AU), and sources (SO) in studies examining students' views on online courses. Keywords such as "online", "students", "higher-education", "technology", and "engagement" are prominent in studies on online education. Authors, in relation to certain keywords, represent the leading names in the field. For example, researchers such as "Sun J", "Wang C", and "Guerrero-Roldan AE" are known for their important studies on online education. The journals in which the research is published are the "Journal of Educational Computing Research", "BMC Medical Education", and "Computers & Education", and the conferences are the main journals, while the "International Conference of Education, Research and Innovation" is the main conference.

Most Local Cited Sources

Most local cited sources of academic studies on online courses is presented in Table 3.

Table 3. Most Local Cited Sources

Sources	Articles
COMPUT EDUC	697
COMPUT HUM BEHAV	235
BRIT J EDUC TECHNOL	224
ANAT SCI EDUC	196
INT REV RES OPEN DIS	193
BMC MED EDUC	183
MED TEACH	160
INTERNET HIGH EDUC	158
MED EDUC	135
ACAD MED	129

When the most locally cited sources are examined in Table 3, it is seen that the journal Computers & Education (n = 697) is the most cited source. This is followed by Computers in Human Behavior (n = 235), British Journal of Educational Technology (n = 224), Anatomical Sciences Education (n = 196) and International Review of Research in Open and Distributed Learning (n = 193), respectively. In addition, the journals BMC Medical Education (n = 183), Medical Teacher (n = 160), Internet and Higher Education (n = 158), Medical Education (n = 135) and Academic Medicine (n = 129) are among the frequently cited important academic sources in the fields of online education and technology-supported learning. These findings reveal that research on online education is particularly concentrated in the fields of educational technologies and health sciences.

Core Sources by Bradford's Law

Core sources by Bradford's law of academic studies on online courses is presented in Table 4.

Table 4. Core Sources by Bradford's Law

SO	Rank	Freq	cumFreq	Zone
BMC medical education	1	23	23	Zone 1
Education and information technologies	2	13	36	Zone 1
Sustainability	3	13	49	Zone 1
Computers \& education	4	9	58	Zone 1
Anatomical sciences education	5	7	65	Zone 1
Inted2012: international technology, education and development conference	6	7	72	Zone 1
Journal of information technology education-research	7	7	79	Zone 1
Online learning	8	7	86	Zone 1
10th international conference of education, research and innovation (iceri2017)	9	6	92	Zone 1

5th international conference of education, research and innovation (ICERI 2012)	10	6	98	Zone 1
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Table 4 analyzes the structure of the literature in the field of online courses within the framework of Bradford's Law and evaluates the distribution of sources and citation density. Among the most cited sources constituting the core region, journals such as BMC Medical Education, Education (n = 23) and Information Technologies (n = 13), Sustainability (n = 13), Computers & Education (n = 9) and Anatomical Sciences Education (n = 7) stand out; these sources focus on topics such as online learning in medical education, integration of digital education tools, sustainability dimensions and long-term effects, respectively. International conferences such as INTED and ICERI contribute to the development of the field as important platforms where innovative approaches and applications in education are discussed.

Sources' Local Impact

Sources' local impact of academic studies on online courses is presented in Table 5.

Table 5. Sources' Local Impact

Source	h_index	g_index	m_index	TC	NP	PY_start
BMC medical education	9	12	0.692	159	23	2012
Computers \& education	8	9	0.471	645	9	2008
Education and information technologies	8	13	1,143	217	13	2018
Journal of educational computing research	6	6	0.667	98	6	2016
Sustainability	6	13	1	205	13	2019
Nurse education today	5	6	0.455	138	6	2014
PLOS one	5	6	0.556	76	6	2016
Anatomical sciences education	4	7	0.286	90	7	2011
Applied sciences-Basel	4	5	1	49	5	2021
British journal of educational technology	4	4	0.222	287	4	2007

Table 5 presents the Local Impact Analysis based on metrics such as h-index, g-index, m-index, total citation count (TC), number of articles (NP), and publication start year (PY_start) that evaluate the academic impact of resources in online education literature. h-index measures the stable academic impact of a resource, for example, BMC Medical Education journal's h-index value of 9 indicates that the journal has a permanent impact. g-index reflects the total impact of the most cited articles, for example, Sustainability journal's g-index value of 13 indicates that certain articles of the journal have high academic impact. m-index measures the annual growth rate of h-index, for example, Education and Information Technologies journal's m-index value of 1.143 reveals that this resource has shown effective growth in a short period of time. The total number of citations (TC) shows the overall impact of all citations to a source, with the journal Computers & Education proving its impact in this field with 645 total citations. The number of articles (NP) indicates the productivity of the sources, while PY start indicates the year in which a source first entered the academic world, and for example, the 2021 start of the journal

Applied Sciences - Basel reveals that it is a relatively new source. This analysis provides a detailed understanding of the academic impact and growth dynamics of sources in the online education literature.

Sources' Production over Time

Sources' Production over Time of academic studies on online courses is presented in Figure 4.

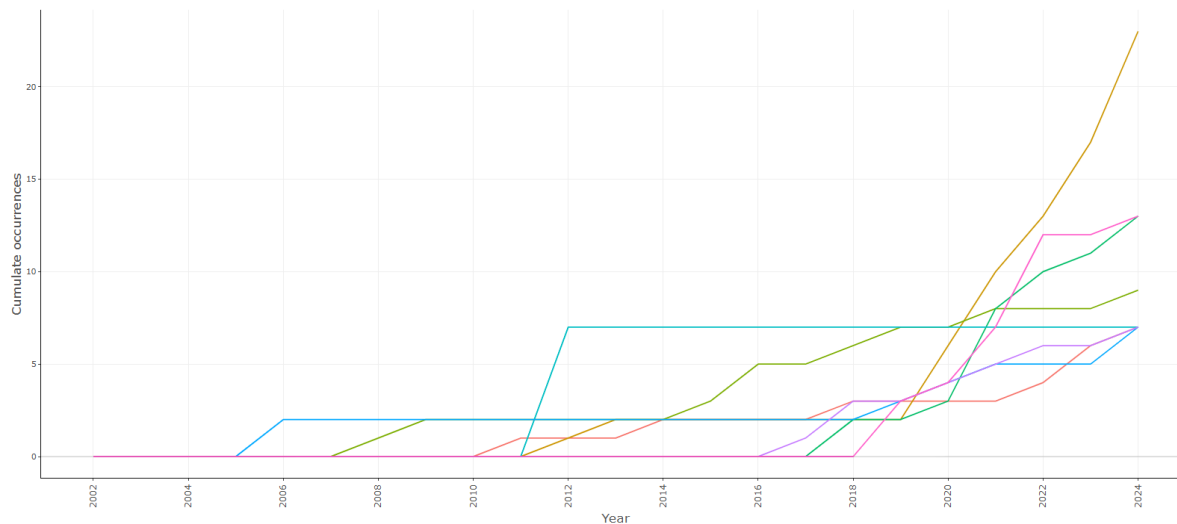


Figure 4. Sources' Production over Time

Figure 4 shows the cumulative production intensity of certain sources over time. Each colored line in the graph represents a different source (journal, conference, book, etc.) and follows the article production trend of these sources over the years. The slope of the lines reflects the production rate of the source; for example, a steeper slope indicates that the production rate increased in those years, while a flatter slope indicates that the increase slowed down or remained constant. It shows that interest in online courses increased after 2020 and the number of academic studies on this subject increased rapidly. The top line in the graph represents the source that produced the most articles, and it is noteworthy that this source showed a significant increase after 2020. While some sources followed a regular production trend from the early years, some became active only in recent years and increased their production rate. The rapidly increasing production intensity of some sources, especially after 2010, is striking.

Most Relevant Authors

Most relevant authors of academic studies on online courses is presented in Table 6. Table 6 presents the authors who contributed the most to the literature on online courses and the contribution level of each author in detail. Under the heading "Most Relevant Authors", the total number of articles and the Articles Fractionalized value and the contribution rate of the authors were analyzed. HIRATA Y ($n = 6$) stands out as the most productive author, with a fractionalized value of 4.00, indicating a high individual contribution. LIU Z ($n = 5$), who came in second, contributed more to co-authored studies with a fractionalized value of 0.77. GOTLIB J ($n = 4$,

fractionalized = 1.39) and BANERES D (n = 4, fractionalized = 1.45) are in the third and fourth places. When the collaboration dynamics between authors are examined, it is seen that some authors are involved in more co-authored studies, but their individual contribution rates are lower. For example, D. D (n = 3, fractionalized = 0.44) and LIU S (n = 4, fractionalized = 0.67) have high productivity in terms of total number of articles, but their individual contribution rates are limited. HIRATA Y is the leading author in terms of production and contribution, making significant contributions to the online courses literature. Authors such as GOTLIB J, BANERES D, and LUJAN-MORA S also have a notable impact in terms of fractionalized values.

Table 6. Most Relevant Authors

Authors	Articles	Articles Fractionalized
HIRATA Y	6	4.00
LIU Z	5	0.77
GOTLIB J	4	1.39
LIU S	4	0.67
ADANIR GA	3	0.67
BANERES D	3	1.45
D. D	3	0.44
GROSSECK G	3	1.03
GUERRERO-ROLDAN AE	3	0.78
LUJAN-MORA S	3	1.17

Most Local Cited Authors

Most local cited authors of academic studies on online courses is presented in Table 7.

Table 7. Most Local Cited Authors

Author	Local Citations
AN H	3
CHENG HNH	3
HERRLER A	3
IMRAN AS	3
KASTRATI Z	3
KURTI A	3
LIM K	3
LIU S	3
LIU Z	3
PENG X	3

Table 7 presents the authors' contribution to the literature by evaluating the local impact in the field of online courses with various criteria. AN H, CHENG HNH, HERRLER A, IMRAN AS, KASTRATI Z, KURTI A, LIM

K, LIU S, LIU Z and PENG X stand out as equally influential authors with local citations each (n=3), indicating that they interact within the same literature network.

Authors' Production over Time

Authors' production over time of academic studies on online courses is presented in Table 8. Table 8 provides a detailed overview of the productivity and citation performance of the authors in the field of online courses over the years, allowing for the evaluation of academic impact. Adanır GA received a total of 26 citations with two articles published in 2020, and the annual citation rate was recorded as 5.2. However, the fact that an article published in 2022 did not receive any citations shows that the author's academic impact has decreased over time. While Baneres D's two citations in 2021 revealed the highest value in terms of annual citation average, D.D's two citations in 2022 showed an increasing trend in terms of productivity. On the other hand, Gotlib J's low citation performance in the early period and the article he published in 2013 did not receive any citations.

Table 8. Authors' Production Over Time

Author	year	freq	TC	TCpY
ADANIR GA	2020	2	26	5.2
ADANIR GA	2022	1	0	0
BANERES D	2017	1	0	0
BANERES D	2018	1	1	0.143
BANERES D	2021	1	8	2
D. D	2013	1	0	0
D. D	2021	1	0	0
D. D	2022	1	2	0.667
GOTLIB J	2012	2	3	0.231
GOTLIB J	2013	1	0	0

Author Productivity through Lotka's Law

Author productivity through Lotka's law of academic studies on online courses is presented in Table 9.

Table 9. Author Productivity Through Lotka's Law

Documents written	N. of Authors	Proportion of Authors
1	2935	0.948
2	141	0.046
3	17	0.005
4	2	0.001
5	1	0
6	1	0

Table 9 presents an analysis consistent with Lotka's Law by examining the distribution of productivity in academic authorship in the field of online courses. This law states that productivity in authorship is generally based on a small number of highly productive authors and a large number of less productive authors. The table begins with $n=2935$ authors who published only one document, this group accounts for 94.8% of the total authors, confirming that the majority in the authorship world make a single contribution. The second group of 141 authors (2 documents) accounts for 4.6% of the total authorship, marking the beginning of the category of prolific authors. On the other hand, there are only 17 authors who published 3 documents and only 4 authors who published 4 or more documents. Looking at these highly prolific authors, it can be seen that they constitute a small portion of the total authors, but their impact on the field is great.

Authors' Local Impact

Authors' local impact of academic studies on online courses is presented in Table 10.

Table 10. Authors' Local Impact

Author	h_index	g_index	m_index	TC	NP	PY_start
LIU Z	4	5	0.444	59	5	2016
LIU S	3	4	0.333	53	4	2016
PENG X	3	3	0.333	52	3	2016
SUN J	3	3	0.333	52	3	2016
ADANIR GA	2	3	0.4	26	3	2020
BACK DA	2	2	0.667	12	2	2022
BARCHINO PLATA R	2	2	0.143	62	2	2011
BICEN H	2	2	0.167	87	2	2013
BROWN G	2	2	0.095	43	2	2004
BUCEA-MANEA-TONIS R	2	2	0.667	31	2	2022

Table 10 presents important metrics that evaluate the local impact of academic authors in the field of online courses. These metrics include h-index, g-index, m-index, total citation count (TC), number of publications (NP), and first publication year (PY_start). LIU Z stands out as the author with the highest local impact, proving his research impact with h-index = 4 and g-index = 5. LIU S and PENG X have achieved similar citation counts throughout their academic careers, which they started in 2016. Authors such as ADANIR GA, who joined academic production in 2020, have relatively more limited citation and publication counts. Researchers such as BACK DA and BUCEA-MANEA-TONIS R stand out in terms of productivity with their high m-index values.

Most Relevant Affiliations

Most relevant affiliations of academic studies on online courses is presented in Table 11. Table 11 analyzes the most influential institutional contributions in the field of online courses, showing the universities and research centers that contribute intensively in this field. According to the prominent findings, UNIV POLITECN

VALENCIA (n=23) is in a leading position and shows a high productivity in technology and education-related studies. Among the Turkish universities, ANKARA UNIVERSITY (n=16) and EGE UNIVERSITY (n=15) demonstrate the strong contributions of Turkey in the field of online education. In addition, NEAR EAST UNIVERSITY (n=15) plays an important role in this field. Universities in Spain are actively conducting research in the field of online education, especially with institutions such as UNIV VALENCIA (n=14), UNIV GRANADA (n=13), and UNIV MALAGA (n=11).

Table 11. Most Relevant Affiliations

Affiliation	Articles
UNIV POLITECN VALENCIA	23
ANKARA UNIV	16
EGE UNIV	15
NEAR EAST UNIV	15
UNIV VALENCIA	14
UNIV GRANADA	13
UNIV NACL AUTONOMA MEXICO	13
CHARITE UNIV MED BERLIN	11
UNIV MALAGA	11
UNIV PITTSBURGH	11

Affiliations' Production over Time

Affiliations' production over time of academic studies on online courses is presented in Figure 5.

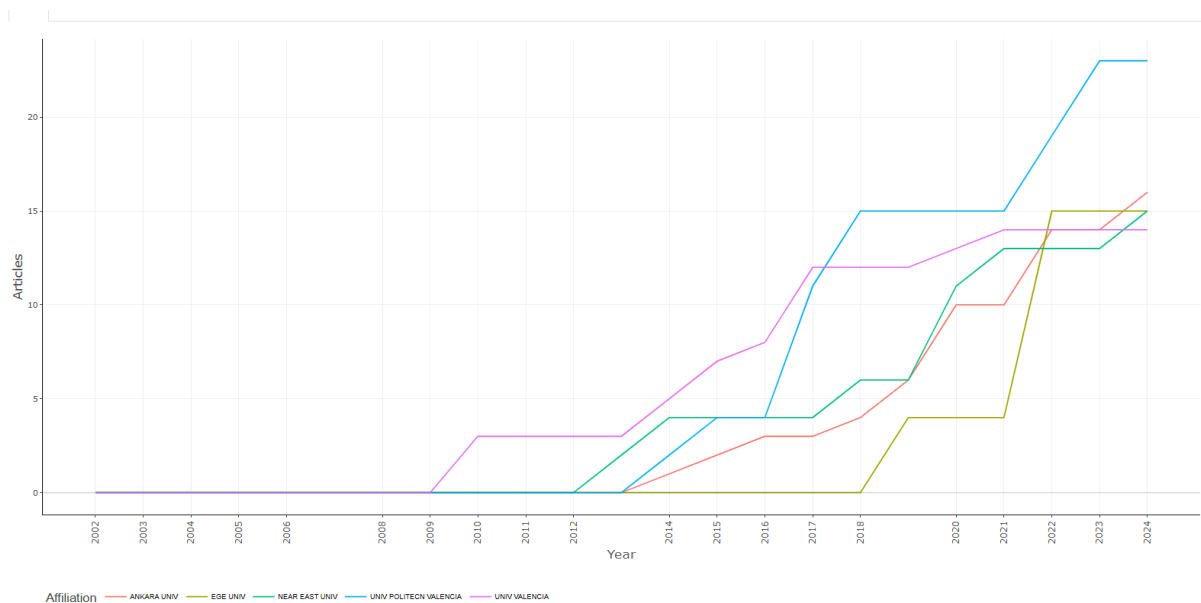


Figure 5. Affiliations' Production Over Time

Figure 5 helps to analyze the research productivity of specific universities over the years, and their leadership and

collaboration trends in the field. According to the prominent findings, UNIV POLITECN VALENCIA has shown a rapidly increasing productivity since 2014 and has reached the top of the list with (n=23) articles as of 2024. NEAR EAST UNIVERSITY started production in 2013 and made a significant leap after 2020, showing a continuous increase with (n=15) articles in 2024. ANKARA UNIVERSITY has seen a significant increase in productivity since 2014, with a further increase especially after 2019. In contrast, EGE UNIVERSITY made a significant leap in its productivity process that started in 2019 in 2022, but this increase seems to have stopped thereafter.

Corresponding Author's Countries

Corresponding author's countries of academic studies on online courses is presented in Table 12.

Table 12. Corresponding Author's Countries

Country	Articles	Articles %	SCP	MCP	MCP %
USA	127	13.6	123	4	3.1
SPAIN	85	9.1	79	6	7.1
CHINA	69	7.4	57	12	17.4
TURKEY	49	5.3	44	5	10.2
UNITED KINGDOM	42	4.5	38	4	9.5
AUSTRALIA	29	3.1	24	5	17.2
ROMANIA	24	2.6	23	1	4.2
GERMANY	23	2.5	18	5	21.7
POLAND	23	2.5	18	5	21.7
ITALY	22	2.4	18	4	18.2

Table 12 analyzes the international academic contributions and collaboration trends of different countries, showing the leadership and collaboration capacity of these countries in the field of research. The findings of the study reveal that the USA, despite its high productivity, has a low rate of international collaboration, while European countries and countries such as China stand out with their higher rates of international collaboration. Countries such as Germany, Poland, China and Australia in particular stand out as important centers that strengthen international networks. European countries continue their regional leadership with their strong collaboration cultures, while Asian countries such as China and Turkey are becoming more visible in global research networks by increasing their productivity.

Countries' Scientific Production

Countries' scientific production of academic studies on online courses is presented in Table 13. Table 13 shows the scientific production levels of countries in the field of online courses. According to the data, the USA (n=427) stands out as the country with the highest scientific production with articles. Spain ranks second with (n=255)

articles, while China ranks third with 206 articles. Turkey has reached a significant production level with (n=155) articles, while countries such as Germany (n=141), the United Kingdom (n=128), and Australia (n=112) also have high production levels, respectively. Countries such as Romania (n=85), Russia (n=80), and Italy (n=76) produced a lower number of articles. These data clearly show the geographical distribution of research on online courses and in which countries scientific production in this field is concentrated.

Tablo 13. Countries' Scientific Production

Country	Freq
USA	427
SPAIN	255
CHINA	206
TURKEY	155
GERMANY	141
UK	128
AUSTRALIA	112
ROMANIA	85
RUSSIA	80
ITALY	76

Countries' Production over Time

Countries' production over time of academic studies on online courses is presented in Figure 6.

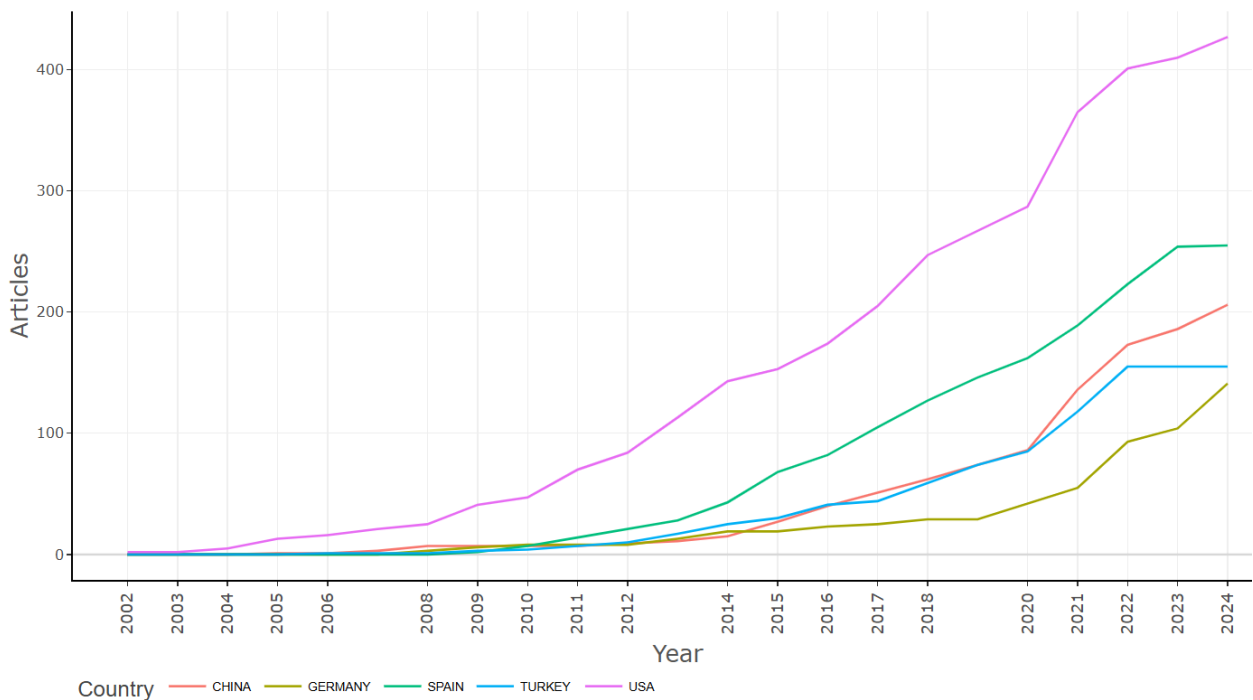


Figure 6. Countries' Production over Time

Figure 6 shows data showing trends in academic production in online courses for specific countries over the years. The United States (USA), in particular, has been showing a continuously increasing momentum since 2002 and has reached its highest production level by 2024. Countries such as Spain and China have also shown significant growth and have accelerated their production since 2010. Turkey and Germany, on the other hand, have recorded significant increases in recent years despite having lower production levels compared to other countries.

Most Cited Countries

Most cited countries of academic studies on online courses is presented in Table 14.

Table 14. Most Cited Countries

Country	TC	Average Article Citations
USA	1459	11.50
UNITED KINGDOM	1276	30.40
CHINA	726	10.50
TURKEY	547	11.20
SPAIN	524	6.20
AUSTRALIA	430	14.80
GERMANY	405	17.60
CANADA	226	14.10
INDIA	164	10.20
KOREA	149	49.70

Table 14 evaluates the scientific impact and visibility of countries in research on online courses. The total number of citations and the average citation rates per article reflect the quality of research outputs and their impact in the international arena. The USA is the leader with a total citation rate of (n=1459) and a citation rate of 11.50 per article, demonstrating a stable performance in terms of productivity and citation potential. Similarly, the United Kingdom produces high-impact studies with a citation rate of 30.40 per article. Turkey stands out in the global ranking with a total citation rate of (n=547) and a citation rate of 11.20 per article. Korea achieves a high scientific impact with a small number of publications, displaying a striking citation rate of 49.70 per article. Germany, Australia and Canada stand out with their high citation rates per article, and attract attention in the international arena with the depth and reference value of their publications. Spain, despite having a high volume of publications with a total of (n=524) citations and 6.20 citations per article, shows that some of its works are not cited enough.

Most Global Cited Documents

Most global cited documents of academic studies on online courses is presented in Table 15.

Table 15. Most Global Cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
Kemp N, 2014, Front Psychol	10.3389/fpsyg.2014.01278	193	17.55	15.97
Woltering V, 2009, Adv Health Sci Educ	10.1007/s10459-009-9154-6	149	9.31	4.89
Kanuka H, 2007, Br J Educ Technol	10.1111/j.1467-8535.2006.00620.x	148	8.22	5.13
An H, 2009, Comput Educ	10.1016/j.compedu.2009.04.015	139	8.69	4.56
Lee J, 2019, Sustainability	10.3390/su11040985	132	22.00	16.86
Comas-Quinn A, 2011, Recall	10.1017/S0958344011000152	124	8.86	10.37
Hsia Lh, 2016, Comput Educ	10.1016/j.compedu.2016.02.004	117	13.00	4.04
Hew Kf, 2008, Comput Educ	10.1016/j.compedu.2007.11.002	114	6.71	5.43
Singal A, 2021, Surg Radiol Anat	10.1007/s00276-020-02615-3	101	25.25	10.58

Table 15 The most cited global studies in the literature reveal the broad scope and interdisciplinary impact of this field. In particular, LEE J, 2019, SUSTAINABILITY, with an annual citation average of 22.00, emphasizes the importance of new approaches in online education. Although older studies such as KANUKA H, 2007, BR J EDUC TECHNOL have left a lasting impact over time, their normalized citation impact has remained relatively low compared to more recent studies. This field, where interdisciplinary impacts are prominent, focuses on different themes such as education, technology, health, and sustainability. Studies such as HSIA LH, 2016 and HEW KF, 2008, which particularly emphasize the role of technology in education, shed light on the changing priorities of the field. Among the new and rapidly rising studies, SINGAL A, 2021, SURG RADIOL ANAT, achieves high citation rates in a short time and shows that it responds to current needs at the time it was published.

WordCloud

WordCloud of academic studies on online courses is presented in Figure 7.



Figure 7. WordCloud

Figure 7 visualizes the most frequently used keywords in the literature on online courses as a word cloud. Among the keywords, expressions such as "education," "students," "online," and "perceptions" stand out, indicating that student perceptions, the general structure of education, and technology are important research topics in online education. Other notable words include "performance," "impact," and "technology," emphasizing the impact of online education on student performance and the importance of technology use. This word cloud is a useful tool for analyzing which concepts are prominent in the relevant literature and which themes the research focuses on. In particular, the topics of student-centered approaches ("students," "engagement") and quality in education ("quality," "design") reveal that the pedagogical and technical dimensions of online learning have been extensively examined.

Trend Topics

Trend topics of academic studies on online courses is presented in Figure 8.

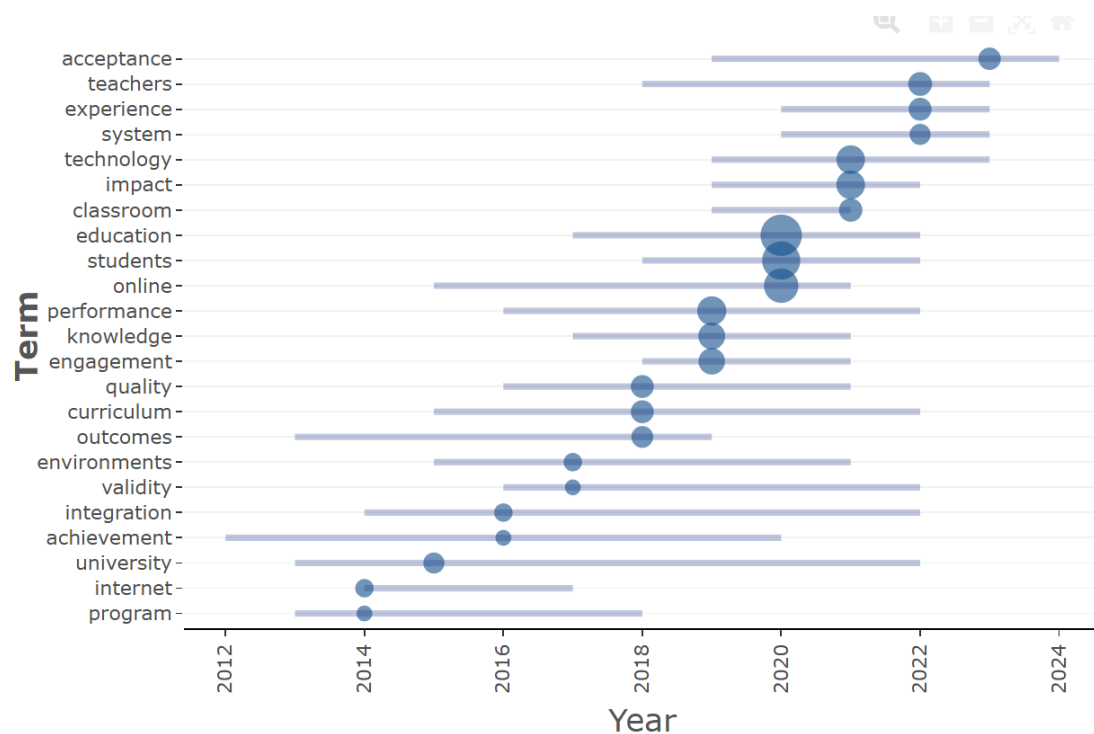


Figure 8. Trend Topics

Figure 8 visualizes the popularity of terms used in online course research over the years. The horizontal axis represents the years, while the terms on the vertical axis reveal the key themes of the studies. The density and location of the dots indicate the frequency of use of a particular term and the period in which it became prominent. As can be seen from the graph, key terms such as "students," "online," "education," and "technology" have been used with increasing momentum, especially after 2020. This can be associated with the increased interest in online education with the COVID-19 pandemic. More specific terms, such as "integration" and "validity," reflect more focused themes in academic studies and show that interest in these terms has diversified over time.

Clustering by coupling

Clustering by coupling of academic studies on online courses is presented in Figure 9.

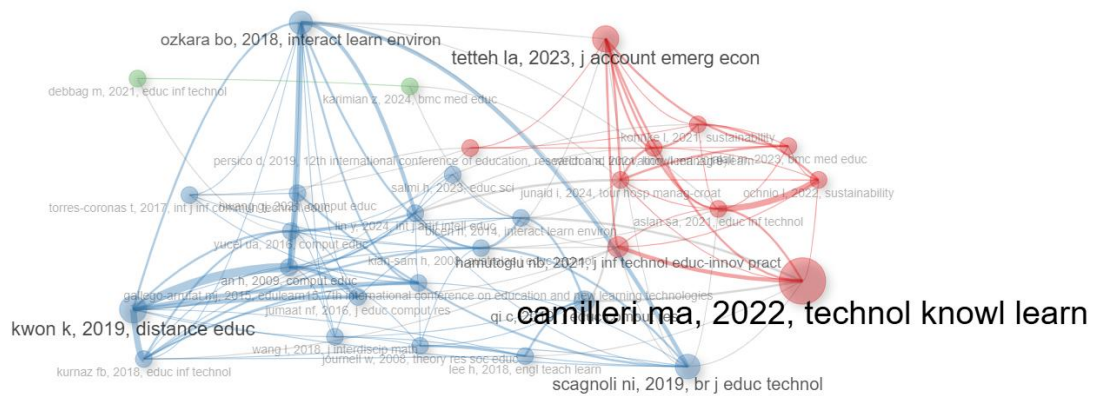


Figure 9. Clustering by coupling

Figure 9 “Clustering by Coupling” map visualizes the relationships and thematic clusters among scientific studies on online courses. Clusters represented by different colors indicate prominent subthemes and academic focal points in the literature. The blue cluster on the map represents studies focusing on technical dimensions of online learning such as technological infrastructure and learning management systems. In this cluster, analyses on platform effectiveness and user experience are particularly prominent. The red cluster includes literature focusing on pedagogical effects of online education, sustainability and teaching-learning methods; it points to studies on educational policies and long-term effects. The green cluster stands out as a less dense group addressing discipline-specific applications such as online medical education. The connections (lines) on the map indicate citation relationships or subject similarities between studies. Nodes with dense connections represent main sources that are of central importance in the literature and serve as references to other studies. This structure provides important information in terms of understanding the basic literature of the field and determining strategic focal points for future research.

Co-occurrence Network

Co-occurrence of academic studies on online courses is presented in Figure 10. Figure 10 co-occurrence network analysis shows the themes around which studies addressing students' views in the context of online courses are concentrated in the literature. The concepts of students and education, which are at the center of the network, constitute the main focal points of these themes and have a dense network of relationships with other concepts. In particular, concepts such as technology, satisfaction, feedback and curriculum emphasize the importance of student experiences, technology use and teaching processes in online education. Different thematic clusters spreading from the central concepts indicate different dimensions such as student satisfaction, technology integration and teaching competencies as prominent titles in the literature. When looking at the structure of the network, the thematic clusters represented by green, red and blue colors attract attention. The green cluster focuses on the impact of technology integration on learning outcomes with concepts such as technology and outcomes in

online education. The red cluster highlights the satisfaction and participation levels of students towards courses with the concepts of satisfaction and engagement. The blue cluster points to the importance of teaching environments in online courses and competencies related to teacher roles, with concepts such as teachers, competence and environments.

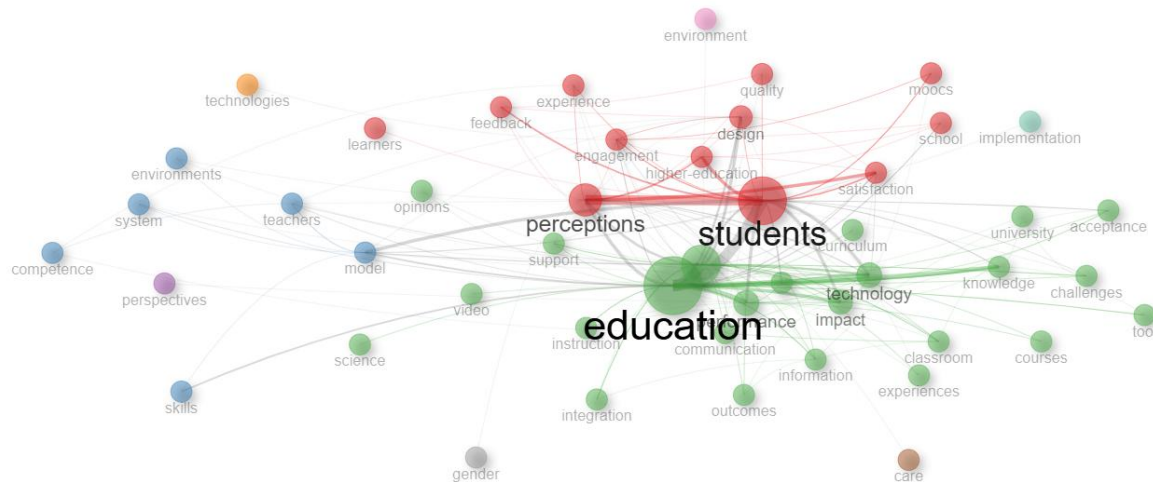


Figure 10. Co-occurrence Network

Collaboration Network

Collaboration of academic studies on online courses is presented in Figure 11.

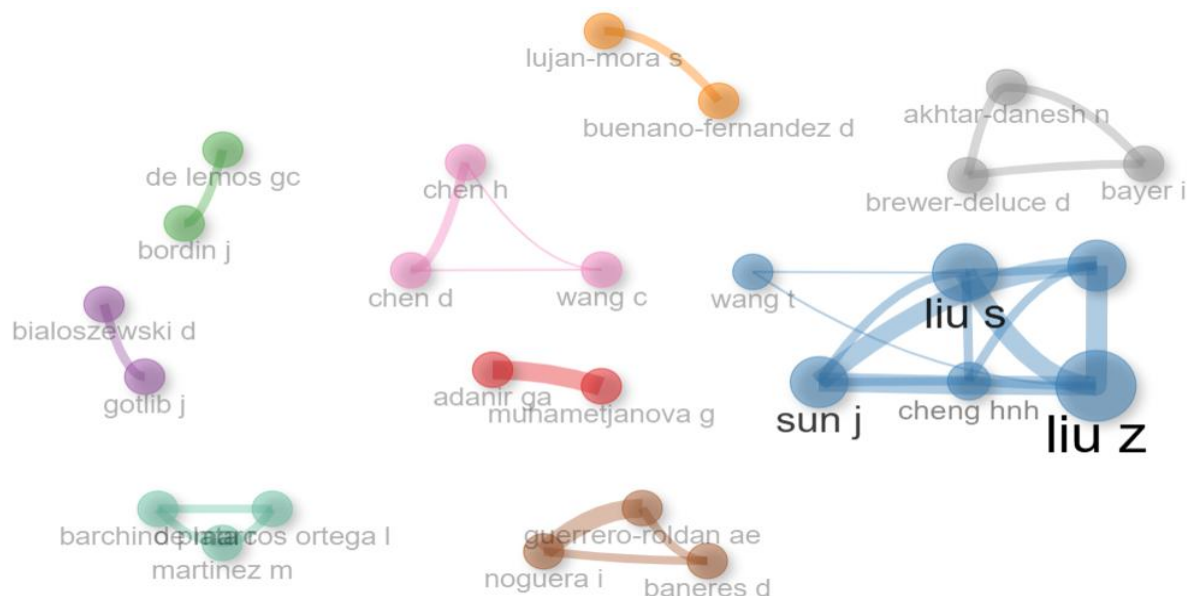


Figure 11. Collaboration Network

Figure 11 collaboration network shows the relationships and collaborative work structure among authors in the

literature on online courses. The analysis of the network shows that certain authors are in a central position and play a leading role in the advancement of studies in this field. For example, Liu S and Liu Z stand out as the nodes with the densest connections in the network and indicate that they have a significant influence in the literature. In addition, subgroups such as Chen H - Chen D - Wang C and Guerrero-Roldan AE - Baneres D - Noguera I indicate that these authors are in close collaboration and probably work on similar themes. On the other hand, isolated groups such as De Lemos GC - Bordin J or Bialoszewski D - Gotlib J have a more independent position in the literature and are located in the peripheral area of the network. Although the density of the network is generally limited, the centralization of certain nodes shows that certain authors and groups play a critical role in the literature on online courses. These findings provide important clues for understanding the development dynamics of the literature and evaluating future collaboration opportunities.

Co-citation Network

Co-citation network of academic studies on online courses is presented in Figure 12.

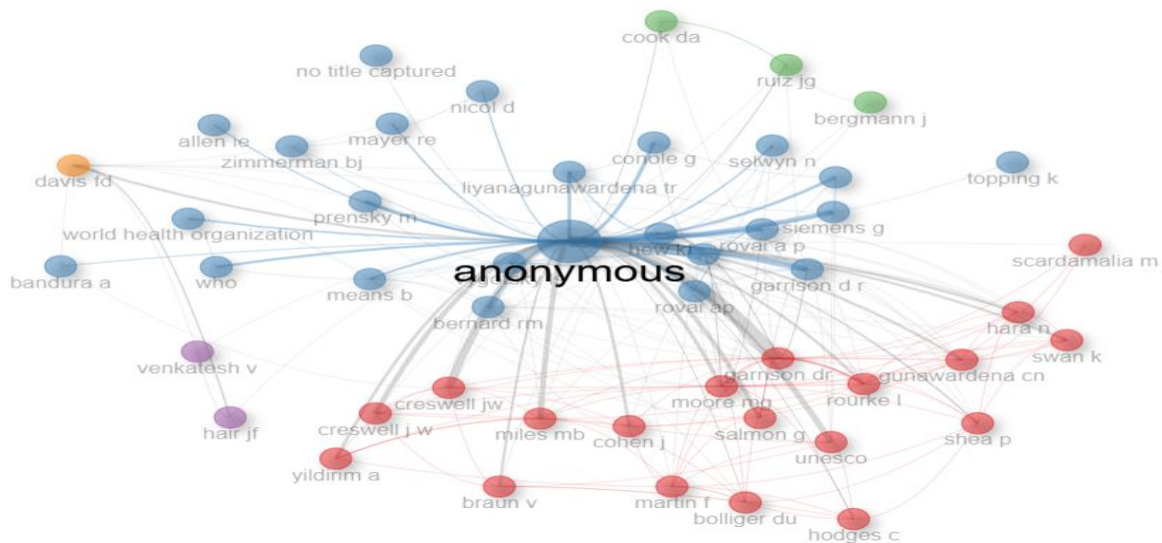


Figure 12. Co-Citation

Figure 12 Co-citation network shows which authors and studies are used as basic reference points for other studies in the literature on online courses. Analysis of the network shows that the node labeled as Anonymous assumes a central role, which may be due to a systematic error or the merging of multiple sources. In addition, authors such as Davis FD, Bandura A, Zimmerman BJ, Prensky M, and Mayer RE stand out with their high density of connections and degrees of centrality, and play an important role in establishing the theoretical foundations of this field. The dense blue area in the network indicates studies on online learning, pedagogical approaches, and cognitive theory, while authors such as Creswell JW, Gunawardena CN, and Swan K in the red area may have focused specifically on interaction, collaboration, and research methodologies in online learning. On the other hand, authors such as Cook DA and Bergmann J in the peripheral parts of the network represent studies that can be associated with more specific or sub-themes.

Factorial Analysis

Factorial analysis of academic studies on online courses is presented in Figure 13.

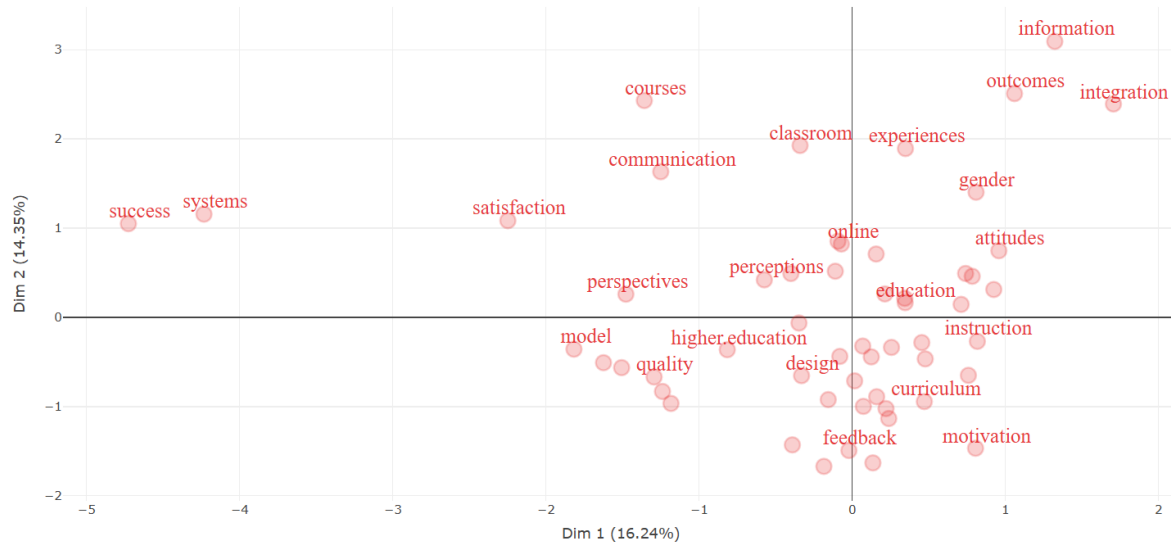


Figure 13. Factorial Analysis

Figure 13 The factor analysis visual examines the distribution of basic concepts and their relationships with each other in the online course literature on a two-dimensional plane. On the horizontal axis (Dim 1), themes are seen to diverge between process-oriented approaches and outcome-oriented concepts. For example, while general success and system-oriented concepts such as "success" and "systems" are positioned on the left, concepts focusing on pedagogical processes such as "curriculum," "instruction," and "feedback" are on the right. On the vertical axis (Dim 2), a divergence is observed between individual-centered (e.g., "gender," "outcomes," and "information") and structure-centered (e.g., "model," "design," and "higher education") themes. As a result of the analysis, concepts such as "information," "outcomes," and "integration" in the upper right region focus on the knowledge transfer, integration, and outcomes of online courses; while concepts such as "quality," "higher education," and "model" in the lower left region focus on quality management and strategic planning. In the lower right corner, "instruction," "curriculum," and "motivation" represent the pedagogical dimensions of education. In the upper left corner, "success" and "systems" refer to studies that address success and the functioning of systems in online education.

Thematic Evolution

Thematic evolution of academic studies on online courses is presented in Figure 14. Figure 14 shows the thematic transformation map of the research literature on online courses over time. In the 2002-2019 period, the main themes included "education", "curriculum", "technology", "quality" and "collaboration". During this period, studies focused on the basic building blocks of online education environments and technological integration. However, in the 2020-2024 period, it was observed that these main themes turned into more specific sub-themes and new themes were included in the literature. For example, while the "education" theme was enriched with more

detailed studies on learner experiences, the "technology" theme was detailed with narrower subheadings such as "technologies" and "systems". Additionally, the theme of “curriculum” has been linked to more individual-level themes such as student competence and attitudes.

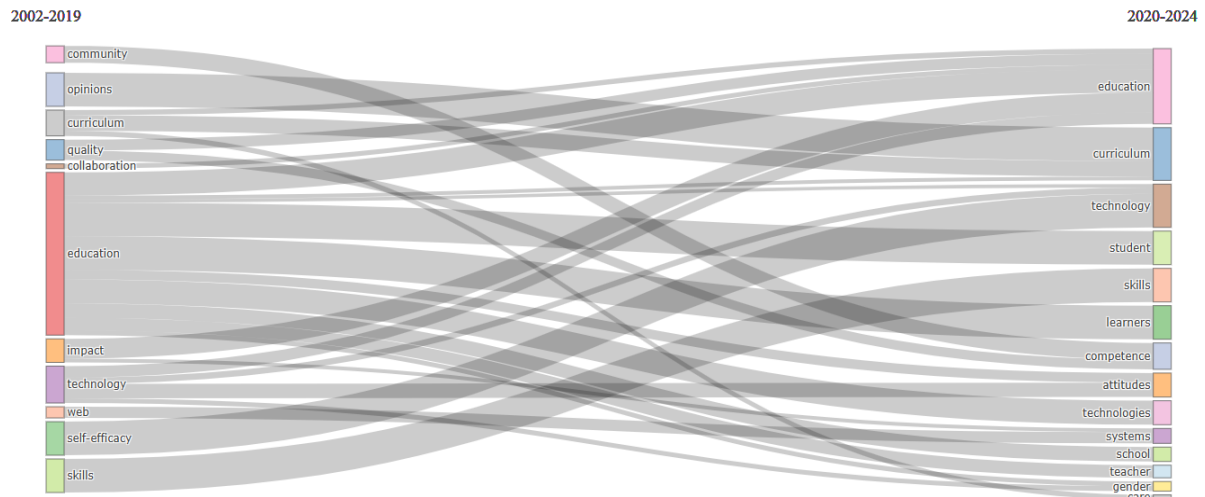


Figure 14. Thematic Evolution

Collaboration Network

Collaboration of academic studies on online courses is presented in Figure 15.

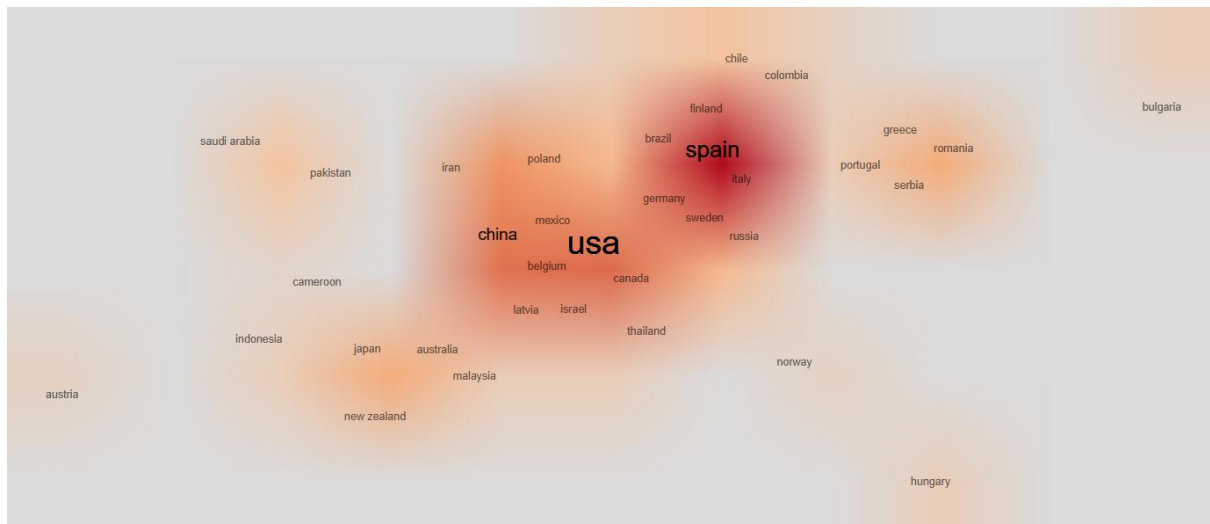


Figure 15. Collaboration Network

Figure 15 shows a map reflecting the network of cooperation between countries in scientific research on online courses. The map shows that the USA and Spain stand out with their intensive cooperation connections. The USA is a leading research center in the field of online education and carries out extensive cooperation with other countries. Similarly, Spain makes significant contributions to the field by establishing strong scientific ties with

countries in Europe and other regions. In addition, countries such as China and Germany stand out in terms of both scientific production and international cooperation. While Germany is an important actor in European-centered cooperation, China is increasing its international cooperation with its expanding scientific influence.

Discussion and Conclusion

Please use 10-point font size. Please margin the text to the justified. Manuscripts should be 1.5 times spaced. A paragraph should have at least 3 sentences. Footnotes and endnotes are not accepted. All relevant information should be included in main text. Do not indent paragraphs; leave a space of one line between consecutive paragraphs. Do not underline words for emphasis. Use italics instead. Both numbered lists and bulleted lists can be used if necessary. Before submitting your manuscript, please ensure that every in-text citation has a corresponding reference in the reference list. Conversely, ensure that every entry in the reference list has a corresponding in-text citation.

Subdivide text into unnumbered sections, using short, meaningful sub-headings. Please do not use numbered headings. Please limit heading use to three levels. Please use 12-point bold for first-level headings, 10-point bold for second-level headings, and 10-point italics for third-level headings with an initial capital letter for any proper nouns. Leave one blank line (1.5 times spaced) before and after each heading. (Exception: no blank line between consecutive headings.) Please margin all headings to the left.

Please use 10-point font size. Please margin the text to the justified. Manuscripts should be 1.5 times spaced. Footnotes and endnotes are not accepted. All relevant information should be included in main text. Do not indent paragraphs; leave a space of one line between consecutive paragraphs. Do not underline words for emphasis. Use italics instead. Both numbered lists and bulleted lists can be used if necessary. Before submitting your manuscript, please ensure that every in-text citation has a corresponding reference in the reference list. Conversely, ensure that every entry in the reference list has a corresponding in-text citation.

In this study, bibliometric analyses of scientific research published in the field of students' online course opinions were conducted. The Web of Science database was searched with the keywords "Online" AND "EDUCATION". In the bibliometric analysis, 932 studies were published from 2002 to 2024. The number of studies included in the study by year and frequency values for citation analysis were determined. In addition, the most cited articles and authors in the field in the data set of the study were determined.

BMC Medical Education Journal is the most widely published journal. Computers & Education Journal was the most cited journal. According to Bradford's Law, there are 16 journals clustered in the first region. Similar to these findings, in the study conducted by Çınar et al. (2024), when the most influential journals on the subject were examined, the journal with the most publications was Computers & Education. Kabakuş and Ayaz (2022) determined the journal with the most publications as Journal of Chemical Education. Çınar et al. (2024) The most cited journal in the research was Computers & Education.

Hirata Y. is the author with the most publications on this subject. Adanır GA is the most cited author. Baneres D and D.D. and gotlib j.. stand out as other leading authors. An H, Cheng HNH, Herrler A, Imran AS, Kastrati Z, Kurti A, Lim K, Liu S, Liu Z and Peng X are among the most cited authors locally. Contrary to these findings, Karagözlü et al. (2024) found that the authors with the highest number of publications and citations were Richardson J. T. E., Bozkurt A. Goksu (2021) found that G. J. Hwang was the most productive researcher in mobile learning.

The university with the most publications is Univ Politecn Valencia. This university is followed by Ankara University and Ege University. Univ Politecn Valencia 2014 and especially, Near East University 13 have made significant breakthroughs in their studies in this field. Çınar et al. (2024) The most studies came from the University of Technology Malaysia, followed by Beijing State University. Kabakuş and Ayaz (2022) It is noteworthy that the most effective distance education researchers in their studies are mainly those working in universities in Taiwan. Artsin and Kahraman (2024) found Anadolu University when examining the institutions where distance education studies were carried out in Turkey.

The country with the most publications is the USA. This country is followed by Spain, China, Turkey, Germany and the United Kingdom. The USA is also the country with the highest number of articles with responsible authors, national articles, international articles and citations, and the average number of citations per article. However, it is noteworthy that Korea, which is not included in this list, has a high average number of citations per article. In another bibliometric analysis in the relevant field article, Karagözlü et al. (2024) stated that the most effective countries in terms of studies on distance education are the United States, Brazil and Turkey. In terms of co-authorship collaboration, the United States, Brazil, Turkey and the United Kingdom stand out as the most productive countries, and it is seen that the United States, England, Australia and Turkey are in the first places in terms of citations. Amoozegar et al. (2018) found in their study that the United States was the most dominant country contributing to distance education research from 1980 to 2016.

Kmp and Grieve's article titled "Face-to-face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. online learning" published in the original research article journal in 2016 became the most cited article in the world. The study titled "Exploring Factors, and Indicators for Measuring Students' Sustainable Engagement in e-Learning" published in 2019 by LEE J, 2019 had the highest annual citation average rate. According to the finding of the co-citation analysis of the studies conducted on interaction in Çınar et al. (2024), it is seen that the article with the highest total link strength with 88 is the study titled "Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction" by Jung et al. (2002). According to Kabakuş and Ayaz (2022), the most effective article was found to be the article titled "A Practical Beginner's Guide to Cyclic Voltammetry" published in the Journal of Chemical Education in 2018

The most frequently used keywords by the authors are expressions such as "education," "students," "online," and "perceptions." These keywords are followed by "Education." Other notable words include "performance," "impact," and "technology." Basic terms such as "students," "online," "education," and "technology" are keywords that have started to be used with increasing momentum, especially after 2020. Alismaiel et al., 2022 The most

important keywords are "covid-19," "social interaction," "higher education," "collaborative learning," and ". Kabakuş and Ayaz (2022) determined that the most prominent keywords are "higher education" and "covid-19."

The co-occurrence network analysis shows that studies on online courses are concentrated around the concepts of "education," "students." The collaboration network reveals that certain authors (e.g., Liu S and Liu Z) are in a central position and have a significant influence in the literature. While the co-citation network identifies the main reference points related to online courses, the "Anonymous" tag stands out as a central node resulting from a systematic error or multiple source merging. Factor analysis examines the distribution of main concepts in the literature, showing that there is a separation between process-oriented and outcome-oriented concepts as well as individual-centered and structure-centered themes. In the study of Artsin and Kahraman (2024), Bozkurt A. and Çınar et al. (2024) Bernard R. M. were determined as the main references.

The thematic transformation map shows that research on online courses is shaped around basic topics such as (education), (curriculum), (technology), (quality) and (collaboration). When the international collaboration network is examined, the USA and Spain stand out as the strongest research centers in this field. The USA, in particular, is a leader in the field of online education and carries out extensive academic collaborations with other countries. Kabakuş and Ayaz (2022) and Amoozegar et al. (2018) found in their study that the USA is the country that contributes the most to online education research. The emergence of the USA as a leading country is also consistent with the results of this study.

Recommendations

This bibliometric analysis study examining students' views on online courses in Web of Science provides important findings for researchers. It is observed that there has been a significant increase in studies on online course views and the number of individuals and organizations operating in this field, especially with the Covid-19 pandemic. This situation shows that online education will be at the center of national and international studies in the future and will find a wider place in programs at every level of education.

The analyses point to the decisive role of American universities, researchers and journals in this field, and the Bradford Law results also support this finding. In the study, it was determined that the concepts of "knowledge," "education," "student," "online" and "perception" were frequently included among the concepts that stood out as the output of online course education. Researchers are advised to focus on publications experiencing a citation explosion and concepts with the highest frequency and centrality values. It seems that these concepts will be addressed even more widely in the future.

In our research, although the WoS (Web of Science) database was used as a source of great scientific importance, it should not be forgotten that other national and international databases such as Scopus, Dimensions, Dergipark and TR Index can also be used. We hope that the findings presented in this study will be useful to other researchers. We also hope that our research will encourage more studies in this field and contribute to the literature on the subject.

Notes

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