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Bibliometric Analysis of Articles on Distance Education During the Last Two Decades

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Abstract

In this study, research on distance education in the last twenty years has been analyzed according to years, keywords, countries, and institutions. The sample of the study consisted of 20,634 studies published on distance education in the last twenty years on Web of Science. Data were downloaded from the database by year. The data obtained were analyzed with WOSViewer. For some analyses, data were analyzed with Power BI version 2.11 software to reach meaningful results. The results were analyzed and compared separately for four quarters or periods of time: 2003-2007, 2008-2012, 2013-2017, and 2018-2023. As a result, most publications were made in 2021 and in the fourth quarter. "Distance learning, higher education, distance education, education, online education, blended learning, online teaching, pandemic, and covid-19" are the most used keywords according to the general distribution of research by keywords. The use of keywords differed by quartiles. The USA, China, England, Australia, and Spain were the countries with the highest number of distance education publications according to general distribution. The USA, England, Australia, Spain, and Saudi Arabia have conducted studies every quarter. The University of California System, N Research Partnership, University of London were the organizations with the highest number of publications during the time periods studied. It was found that only the Open University in the UK published distance education articles in three quarters.

Son Yirmi Yılda Yayınlanan Uzaktan Eğitim Konulu Makalelerin Bibliyometrik Analizi

Anahtar Sözcükler

Uzaktan eğitim
Uzaktan öğretim
Çevrimiçi öğrenme

Makale Hakkında

Gönderim Tarihi
18 Ocak 2024
Kabul Tarihi
01 Mayıs 2024
Yayın Tarihi
30 Haziran 2024

Makale Türü
Araştırma Makalesi

Öz

Bu çalışmada son yirmi yılda yapılan uzaktan eğitim araştırmaları yıllara, anahtar kelimelere, ülkelere ve kurumlara göre analiz edilmiştir. Araştırmanın örneklemini Web of Science veri tabanında son yirmi yılda uzaktan eğitim konusunda yayınlanmış 20.634 makale çalışması oluşturmuştur. Makale verileri yıllara göre veritabanından indirilmiştir. Elde edilen verilerin WOSViewer ile analizi gerçekleştirilmiştir. Bazı analizlerde anlamlı sonuçlara ulaşmak için Power BI sürüm 2.11 yazılımı kullanılmıştır. Sonuçlar dönemlere göre ayrı ayrı analiz edilmiş ve dört çeyrekte karşılaştırılmıştır: 2003-2007, 2008-2012, 2013-2017 ve 2018-2023. Sonuç olarak en fazla yayının 2021 yılında ve dördüncü çeyrekte yapıldığı görülmüştür. Araştırmaların anahtar kelimelere göre genel dağılımında "Uzaktan eğitim, yükseköğretim, uzaktan eğitim, eğitim, çevrimiçi eğitim, harmanlanmış öğrenme, çevrimiçi öğretim, pandemi ve covid-19" en çok kullanılan anahtar kelimeler olmuştur. Anahtar kelimelerin kullanımı çeyreklere göre farklılık göstermiştir. Genel dağılıma göre en fazla uzaktan eğitim ile ilgili yayına sahip ülkeler ABD, Çin, İngiltere, Avustralya ve İspanya olmuştur. ABD, İngiltere, Avustralya, İspanya ve Suudi Arabistan her çeyrekte çalışmalar sağlamıştır. Kaliforniya Üniversitesi, N Araştırma Ortaklığı, Londra Üniversitesi, incelenen dönemlerde en fazla yayın yapan kuruluşlar olmuştur. Üç çeyrekte de İngiltere'de bulunan Açık Üniversite'nin uzaktan eğitim ile ilgili çalışmalarının yayınladığı tespit edilmiştir.

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Introduction

Distance education, also known as distance learning or online learning, is a form of education that allows students to pursue their studies remotely, without the need to attend traditional face-to-face classes on a physical campus. It involves the use of technology to deliver instructional materials, facilitate communication, and support learning activities. Distance education is not a new concept (Andriyani, Puspitasari, Chandrawati, & Ramadhan, 2023). Distance education has been and continues to be researched in various fields such as social sciences, natural sciences, and health sciences. Distance education, whose advantages are (Siregar et. al., 2024) utilized both in educational institutions and other institutions, is the subject of many studies. Many studies have been done in this field and these studies are continuing.

Distance education, with the alternatives and potentials it provides, is no longer an option, but has become today's learning environments and the changes that affect many social, economic, cultural and political situations around the world (Al-Belushi & Al-Hooti, 2024). In this respect, distance education has a multidisciplinary nature (Cheng et al., 2014). In this context, studies on this subject in various fields continue, varying according to the topics covered, collaborations, institutions and countries (Tonbuloglu & Akbel, 2023; Brika et al., 2022; Djeki et al., 2022; Dima et al., 2022; Gao et al., 2021; Hebeci, 2021; Kocdar et al., 2021; Herrera et al., 2018). Conducting studies on a wide spectrum contributes to the literature by adding different perspectives to distance education. A detailed understanding of this broad and diversified field of research is important. After distance education has become a part of our lives, it may be important for future research to determine and compare how this issue is handled in educational environments, the change in the keywords used, and the changing trend according to the characteristics of countries. In this study, a holistic perspective on the subject is presented by comprehensively analyzing all studies carried out in distance education.

This study aimed to conduct a bibliometric analysis of the studies on distance education published in the last twenty years and to compare the characteristics of the studies according to four quartiles or time periods. It has been observed that the studies have been analyzed within the framework of certain year intervals, and no comparative study has been conducted within such a wide time frame. Since the analyzes conducted provide guidance for researchers working in the field, it is important for those working in the field to examine the research conducted on this subject. With this study, researchers in this field will be able to see the general framework of the subject.

In this context, the research problems and sub-problems sought to be answered are given below.
What is the distribution of research by years?

1. What is the general distribution of research by years?
2. What is the distribution of research by quartiles?

What is the distribution of research by keywords?

3. What is the general distribution of the keywords used in the studies?
4. What is the distribution of keywords used in the studies by quartiles?

What is the distribution of research by countries?

5. What is the general distribution of research by countries?
6. What is the distribution of the countries where research was conducted by quartiles?

What is the distribution of research by organizations?

7. What is the general distribution of research by organizations?
8. What is the distribution of the organizations where research was conducted by quartiles?

Related Research

Andriyani et al. (2023), aimed to analyze the trends of research published on distance education in the last three years. The data was analyzed through the Scopus database with the keyword "Distance education" according to the words, article titles and abstracts of the studies between 2020-2022. The study results showed that the number of articles on distance education increased every year with an increasing trend from 2020 to 2022. The study also revealed leading journals, affiliates and countries publishing articles, authors and relevant affiliations. Trend topics discussed in these years have been social media, distance education and learning analytics.

Moreira, Castro and Carvalho (2023) conducted a bibliometric study to determine the keywords, sources, sources and countries of 400 studies published in the Scopus database. The results obtained in the study indicate that new applications including digitalization are included in distance education processes. They also pointed out that motivation and cooperation are very important elements and that students should be at the center of the process.

Tonbuloglu and Akbel (2023) analyzed 238 studies in WoS within the framework of "emergency distance education" during the covid-19 period. The analyzed articles and open-access studies were analyzed according to years, publication type, subject, country, sources, citation, collaboration, and keywords. It was observed that most of the publications were made between 2020-2021 and mostly in the field of educational sciences. The most used keywords were pandemic process, distance education, and higher education.

Brika et al. (2022) analyzed 602 studies published on e-learning in higher education during COVID-19. The information was examined in terms of keywords, authors, organizations, and nations. e-learning concepts in higher education include distance learning, distance learning, interactive learning, online learning, virtual learning, computer-based learning, digital learning, and blended learning (hybrid learning). Artificial intelligence, machine learning, and deep learning are examples of new concepts. The number of studies was found to have grown between 2020 and 2021.

Dima et al. (2022) analyzed 637 articles in the fields of e-learning and cloud technology published in the (WoS) between 2007 and 2022. According to the results, the most productive country in terms of scientific knowledge and number of citations related to e-learning was China. The countries with the most prolific authors were Serbia, Japan, and Romania. The most cited study was the article on critical factors affecting learner satisfaction for successful e-learning. The most used keywords were technology, education, delivery system, and cloud services.

Djeki et al. (2022) did a bibliometric analysis of 12,272 e-learning publications in the WoS database between 2015 and 2020. Spain, the United States, the United Kingdom, China, and Romania have the most publications. The United States was the most frequently mentioned country. Most publications were made by the University

Politehnica of Bucharest, the University of Hradec Kralove, the University of Hong Kong, King Abdulaziz University, and the Complutense University of Madrid. The most cited institutions were The University of Technology Sydney, Islamic Azad University, University of Malaya, Universidade Nova de Lisboa, and the University of Pittsburgh. C. Radu, M. Virvou, S. Lujan-Mora, C. Meinel, and I. Simonova are the authors with the most publications in this field. Among the most cited are A. Tarhini, M. Aparicio, T. Oliveira, K. J. Tarus, and Z. Niu. Computers in Human Behavior, Computers & Education, International Journal of Emerging Technologies in Learning, BMC Medical Education, and British Journal of Educational Technology have been the most influential journals.

Gao et al. (2021) analyzed 877 studies on e-learning in higher education between 2019-2021. It was seen that most publications were made in social sciences. In terms of publication numbers and citation indicators, China, Malaysia, and Saudi Arabia made the highest contribution to the field of e-learning. "Acceptance factors", "perceptions", "mental health", "teachers", "university students", and "e-learning management and organization" were the most frequently addressed topics. As of 2020-2021, it has been observed that machine learning, artificial intelligence, information, and communication technology fields stand out in the field of e-learning.

Hebeci (2021) analyzed 767 articles on Web of Science (WoS) database to determine the trends of articles on distance education during the COVID-19 pandemic. The articles were analyzed in terms of year, country, journal, language of publication, citation, co-authorship, co-occurrence, and co-citation. Most articles were published between 2020-2021. The country with the most publications on the subject was the USA. The Journal of Chemical Education has the most publications. Most of the articles are written in English. Journal of Chemical Education, Journal of Surgical Education, and Education Sciences were the journals with the most cited studies. Chick (2020) was the most cited author. The most cited countries were the USA, the UK, Saudi Arabia, and Austria, respectively. COVID-19, distance education, self-education, and internet/web-based learning are the keywords frequently used by the authors. The most collaborated countries were the USA, the UK, Canada, and China.

Kocdar et al., (2021) analyzed 120 studies in their study aiming to examine the field of engineering in distance education. A systematic study including text mining and social network analysis was conducted. As a result of the research, it was seen that a significant portion of the publications on engineering through distance education falls within the subject area of social sciences, and more interdisciplinary studies are needed. It was found that most of the studies were conducted in the USA, Spain, and Germany. Technology-supported distance engineering education, e-learning and m-learning,

Herrera et al. (2018) retrieved bibliometric indicators from 39,244 papers indexed in Scopus and SCImago Institutional Rankings between 2003 and 2016, creating maps of production and collaboration networks, as well as graphs illustrating the influence of e-learning research in nations and institutions. The studies were compared between two time periods, 2003-2007 and 2012-2016. At the institutional level, the University of Hong Kong and the National Taiwan University of Science and Technology were the universities with the largest number of collaborations, while the USA produced the most publications.

Most of the relevant research above analyzed research conducted during the Covid-19 period and made inferences about that period. Only three studies (Djeki et al., 2022; Dima et al., 2022; Herrera et al., 2018) analyzed the studies in a broader time period. Djeki et al. (2022) examined publications over a five-year period. Dima et al.

(2022) conducted a study based on e-learning and cloud technology. Only Herrera et al. (2018), similar to this study, took a wide range of years as a basis and evaluated the results in two quarters. However, the studies analyzed by Herrera et al. (2018) were very general studies on distance education. This study analyzed focus studies on distance education from 2003 to June 2023, including topics, titles, and keywords related to distance education on the grounds of the proliferation of publications in 2003, as can be seen from the findings.

Method

Bibliometric analysis was used in this research to analyze the articles on distance education in the last two decades. Bibliometric analysis is benefitted to make sense of large volumes of unstructured data, reveal the overall structure or trend for fields, and , map the outputs of analysis (Pritchard; 1981; Donthu et al., 2021). The process in this research with bibliometric analysis was explained as follows.

Sample

In the Web of Science database (Emerging Sources Citation, Social Sciences Citation Index, Science Citation Index Expanded, Arts & Humanities Citation Index) by selecting the "topic (title, abstract, keywords)" with the keywords “distance education, distance learning, distance training, distant training, distance teaching, e-learning, elearning, online education, online learning, online training, online teaching, cloud education, cloud learning, cloud training, cloud teaching, remote education, remote learning, remote training, remote teaching", 20,634 article studies in different disciplines written in English from 2003 to June 2023 were reached. The raw data looked like this:

Research conducted in the last two decades is analyzed under 4 quarters. The 1st quarter is 2003-2007, the 2nd quarter is 2008-2012, the 3rd quarter is 2013-2017, and the 4th quarter is June 2018-2023.

Data Analysis

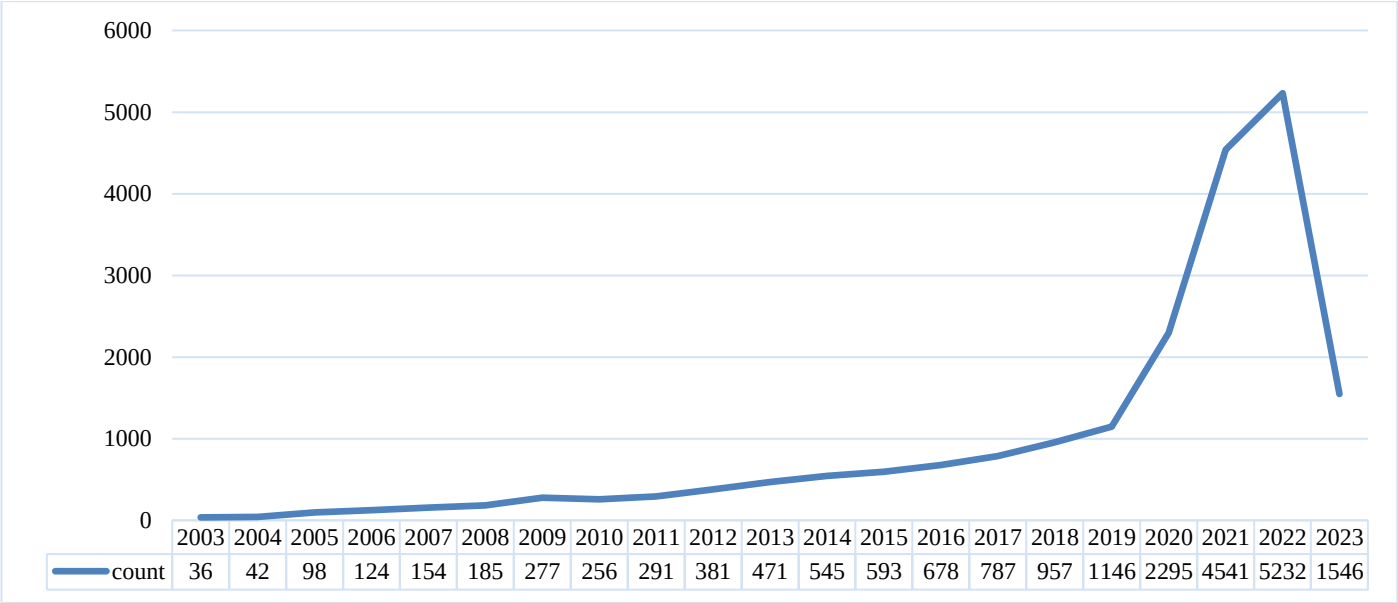
Data were downloaded from the database by year. The data obtained were analyzed with WoSViewer. For some analyses, data were compiled in Microsoft Excel and analyzed with Microsoft Power BI version 2.11 software to reach meaningful results. Microsoft Power BI is used to perform analytical algorithms and productive artificial intelligence-supported analysis to report and graph data.

Findings

What is the distribution of research by years?

1.What is the general distribution of research by years?

The distribution of the studies according to years was analyzed. When Figure 1 is analyzed, it is seen that the studies have increased towards the last years, and a significant increase was observed during the covid 19 period. The reason for the decrease in 2023 is that the articles published until June 2023 are included in the analysis. According to the graph below, the years with the highest number of publications were 2020 (n=2295), 2021 (n=4541), and 2022 (n=5232). The year 2021 was with the highest number of publications.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
count	36	42	98	124	154	185	277	256	291	381	471	545	593	678	787	957	1146	2295	4541	5232	1546

Figure 1. The general distribution of research by years

*Articles published until June 2023 were included in the analysis.

2. What is the distribution of research by quartiles?

The distribution of studies by quartiles was analyzed. When Figure 2 is analyzed, studies have increased according to quarterly periods. In the 2nd quarter, twice as many publications were made compared to the 1st quarter. In the 3rd quarter, this difference increased by approximately 2 times compared to the 2nd quarter. While the increases were 2 times higher by quarters, this difference was 4 times higher in the last quarter. In the 4th Quarter, the number of publications increased 4 times more than the number of publications in the 3rd Quarter.

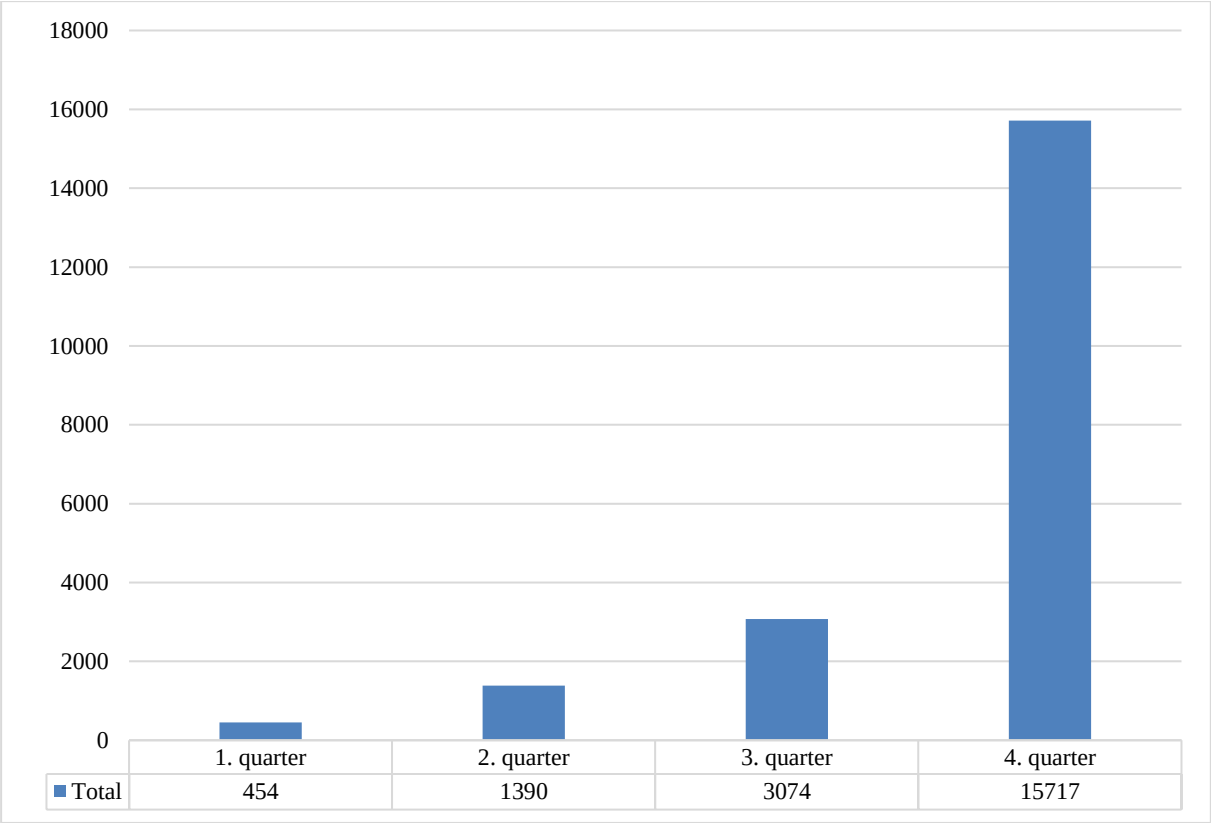


Figure 2. The distribution of research by quartiles by year

What is the distribution of research by keywords?

3.What is the general distribution of the keywords used in the studies?

The keywords used in the studies were analyzed. During the analysis, the frequency of use was determined as 10. Figure 3shows the keywords used in the studies published on distance education during the last twenty years. In general, the top ten most frequently used keywords are as follows: re distance learning, higher education, distance education, education, online education, blended learning, online teaching, pandemic, covid-19 pandemic, medical education, training, remote learning, students, learning, mental health, and teaching. The concepts of online learning, online education, Covid-19, higher education, online teaching, blended learning, medical education, mental health, and training came to the fore.

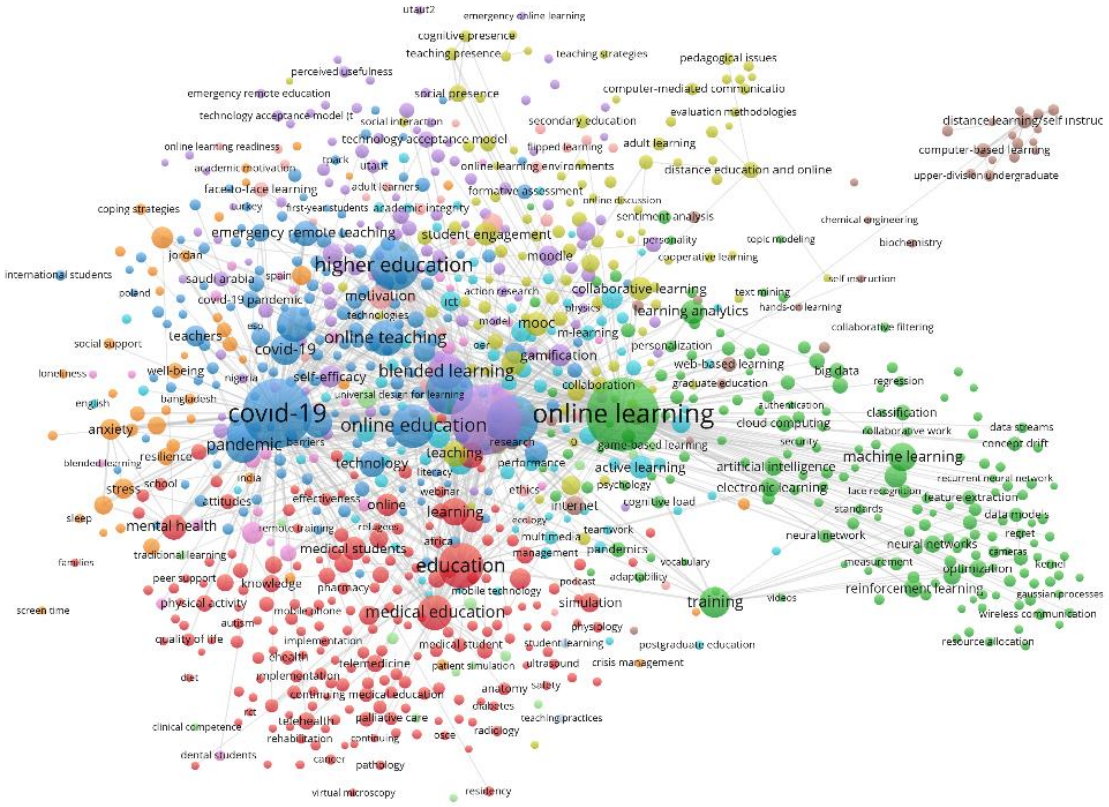


Figure 3. The general distribution of the keywords used in the studies

4.What is the distribution of keywords used in studies by quartiles?

The keywords used in the research conducted in the 1st quarter were analyzed. During the analysis, the frequency of use was determined as 2. When Figure 4 is analyzed, the most frequently used keywords in the 1st quarter are e-learning (n=54), distance education (n=32), distance learning (n=32), online learning (n=30), education (n=13), collaborative learning, (n=9), internet (n=9), learning (n=8), continuing medical education (n=6), learning objects (n=5), simulation (n=5), and web-based learning (n=5). The prominence of these concepts in the 1st quarter is an expected finding compared to those years.

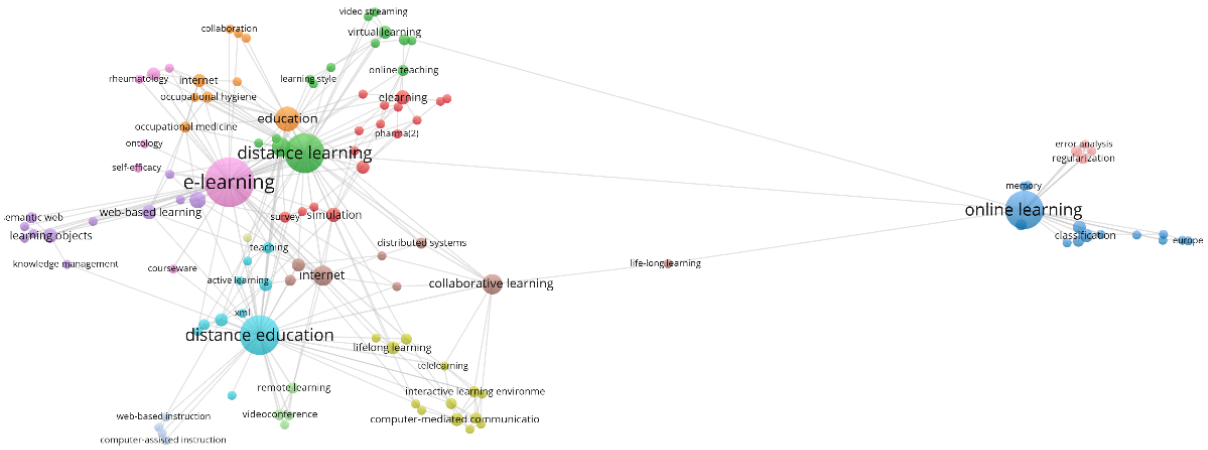


Figure 4. The distribution of keywords used in studies by 1st quarter

The keywords used in the research conducted in the 1st quarter were analyzed. During the analysis, the frequency of use was determined as 3. When Figure 5 is analyzed, the most frequently used keywords in the 2nd quarter are e-learning (n=337), online learning (n=152), distance education (n=129), distance learning (n=109), education (n=43), higher education (n=42), collaborative learning (n=32), technology (n=23), assessment (n=22), and pedagogy (n=18). In addition to these concepts, the concepts of higher education and collaborative learning came to the fore.

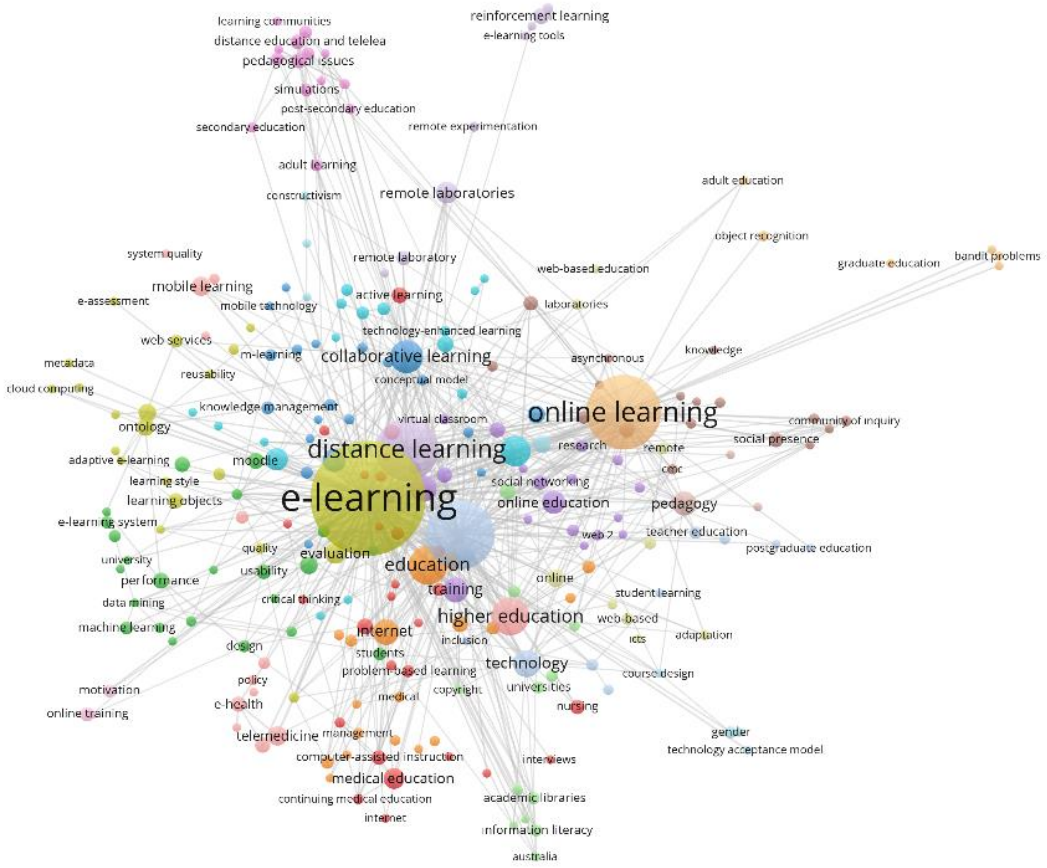


Figure 5. The distribution of keywords used in studies by 2nd quarter

The keywords used in the research conducted in the 2nd quarter were analyzed. During the analysis, the frequency of use was determined as 5. When Figure 6 is analyzed, the most frequently used keywords in 3rd quarter are e-learning (n=576), online learning (n=388), distance education (n=195), distance learning (n=147), education (n=133), higher education (n=126), blended learning (n=105), online education (n=88), medical education (n=62), and MOOCs (n=37).

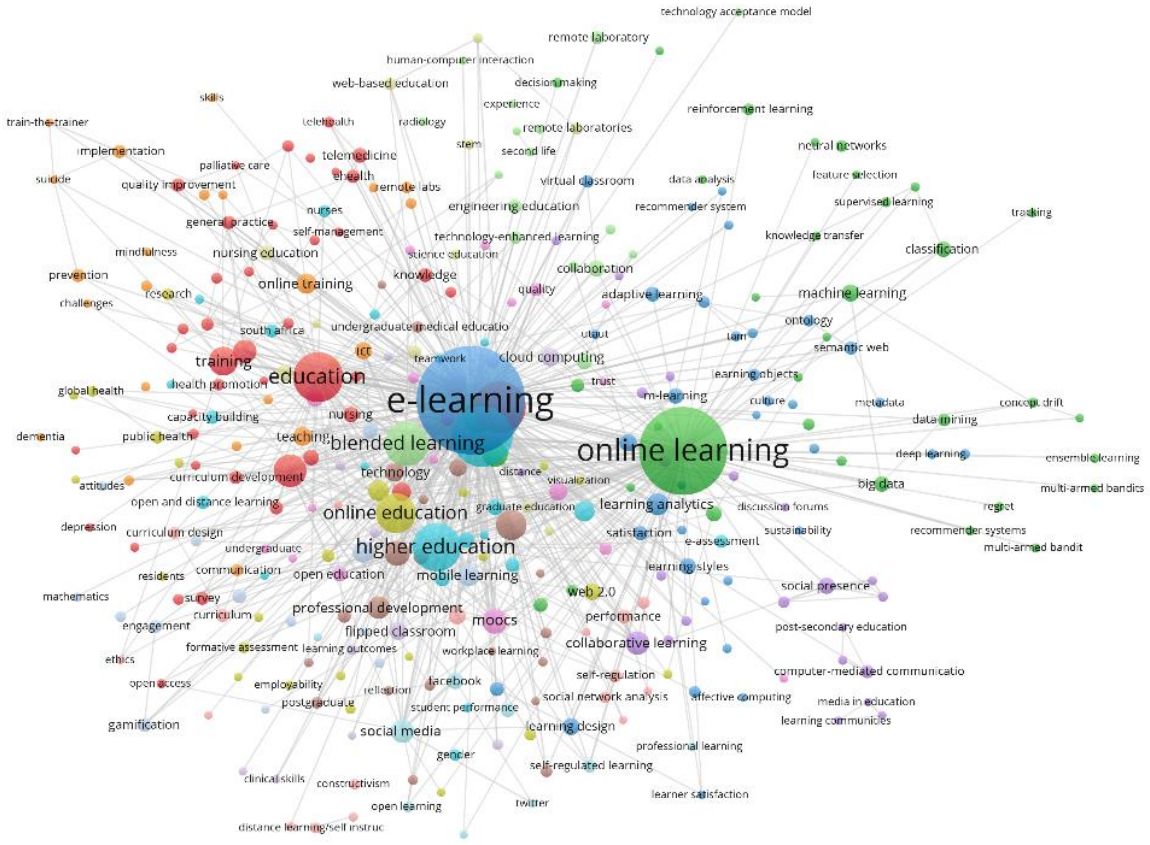


Figure 6. The distribution of keywords used in studies by 3rd quarter

The keywords used in the research conducted in the 3rd quarter were analyzed. During the analysis, the frequency of use was determined as 10. As can be seen in Figure 7, the most frequently used keywords in 4th quarter are covid-19 (n=2609), online learning (n=2454), e-learning (n=1730), higher education (n=963), distance learning (n=933), education (n=706), online education (n=695), distance education (n=659), pandemic (n=465), and medical education (n=378).

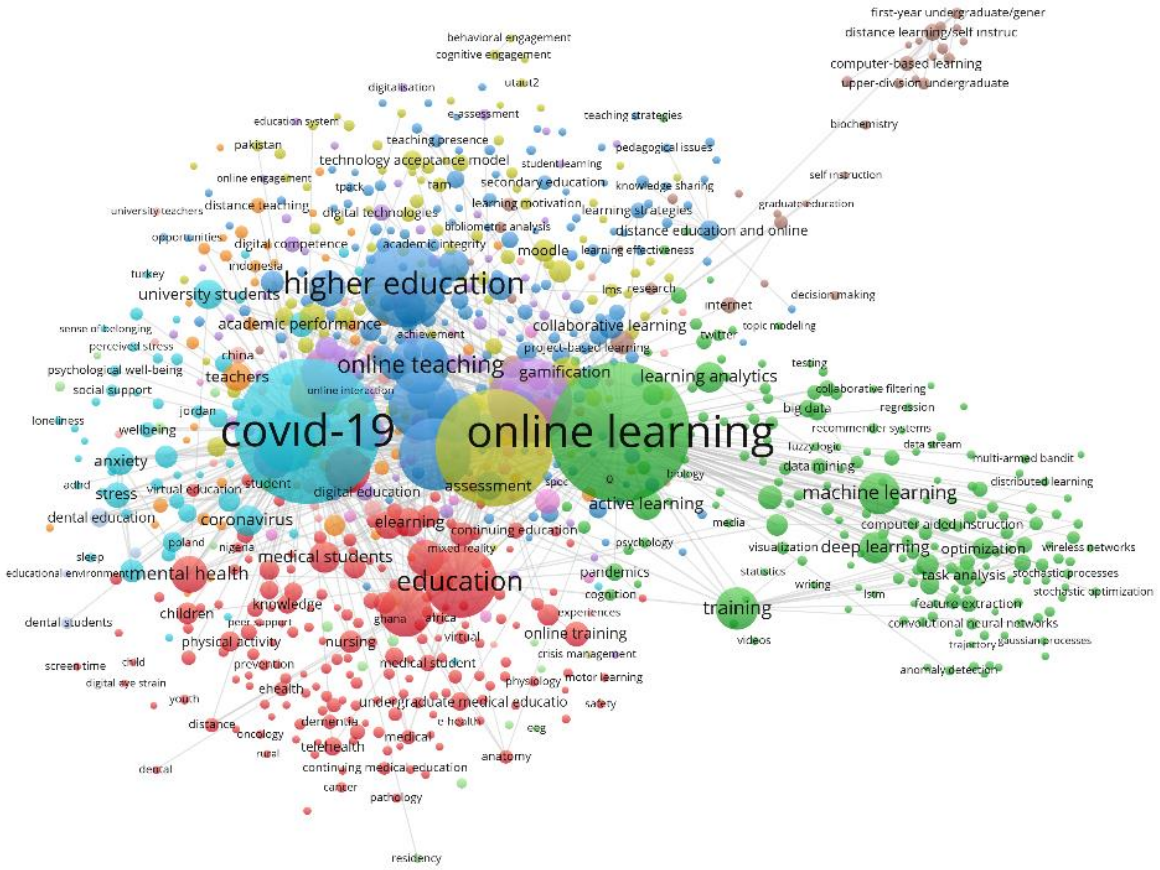


Figure 7. The distribution of keywords used in studies by 4th quarter

Table 1 shows a summary of focused keywords by quarter. These words were used as keywords in the studies. The term "distance" was less frequently used. It was replaced by the term "online". The term "higher education" appeared to be the third most mentioned term during the 3rd quarter.

Table 1. Focused on the keywords used in the studies

1st quarter	e-learning, distance learning, distance education, online learning, and collaborative learning
2nd quarter	e-learning, online learning, and distance learning
3rd quarter	e-learning, online learning, higher education, online education, blended learning, and learning analytics
4th quarter	online learning, covid-19, higher education, and online teaching

Table 2 shows the 40 most frequently used words in the studies according to quarters, and the detailed form of the keywords is given in Table 1. "E-learning", which was the most used and ranked first in the 1st quarter, 2nd quarter, and the 3rd quarter, was replaced by "covid-19" in the 4th quarter.

Table 2. All the words used according to the quarters

#	1st quarter		2nd quarter		3rd quarter		4th quarter	
	keyword	**f**	**keyword**	**f**	**keyword**	**f**	**keyword**	**f**
1	e-learning	49	e-learning	348	e-learning	364	covid-19	2609
2	distance education	32	online learning	152	online learning	388	online learning	2454
3	distance learning	32	distance education	129	distance education	195	e-learning	1925
4	online learning	30	distance learning	109	distance learning	147	higher education	963
5	education	13	education	43	education	133	distance learning	933
6	collaborative learning	9	higher education	42	higher education	126	education	706
7	internet	9	collaborative learning	32	blended learning	105	online education	695
8	learning	8	blended learning	28	online education	88	distance education	659
9	continuing medical education	6	technology	23	medical education	62	online teaching	477
10	elearning	5	assessment	22	mooc	54	pandemic	465
11	learning objects	5	internet	20	training	49	covıd-19 pandemic	463
12	simulation	5	training	19	learning	40	blended learning	394
13	web-based learning	5	pedagogy	18	assessment	37	medical education	378
14	assessment	4	online education	17	moocs	37	covid-19	335
15	classification	4	web 2.0	17	educational technology	33	remote learning	287
16	computer-mediated communication	4	remote laboratories	15	ınternet	33	training	262
17	continuing education	4	evaluation	14	collaborative learning	32	machine learning	251
18	educational technology	4	medical education	14	social media	32	students	237
19	incremental learning	4	educational technology	13	professional development	31	emergency remote teaching	203
20	internet	4	mobile learning	12	learning analytics	29	mental health	203
21	lifelong learning	4	telemedicine	12	mobile learning	29	teaching	176
22	medical education	4	instructional design	10	motivation	29	technology	170
23	virtual laboratory	4	online	10	evaluation	27	motivation	157
24	virtual learning	4	ontology	10	online training	26	medical students	148
25	distance education and telelearning	3	professional development	10	moodle	25	deep learning	146
26	distributed systems	3	semantic web	10	cloud computing	22	student engagement	146

#	1st quarter		2nd quarter		3rd quarter		4th quarter	
	keyword	**f**	**keyword**	**f**	**keyword**	**f**	**keyword**	**f**
27	interactive learning environments	3	web-based learning	10	teaching	22	coronavirus	141
28	learning theory	3	ICT	10	technology	22	learning analytics	141
29	networked learning	3	active learning	9	continuing education	21	social media	141
30	occupational hygiene	3	engineering education	9	flipped classroom	20	active learning	140
31	occupational medicine	3	learning	9	massive open online courses	20	gamification	137
32	online education	3	moodle	9	feedback	19	university students	131
33	online teaching	3	open educational resources	9	learning management system	19	flipped classroom	125
34	pedagogy	3	open learning	9	machine learning	19	anxiety	122
35	quality assurance	3	performance	9	online	19	engagement	122
36	regression	3	reinforcement learning	9	web 2.0	19	online	122
37	regularization	3	collaboration	8	ict	19	self-efficacy	122
38	remote learning	3	continuing education	8	learning design	18	teachers	121
39	reproducing kernel hilbert spaces	3	e-health	8	pedagogy	18	assessment	117
40	semantic web	3	feedback	8	collaboration	17	mooc	116

What is the distribution of research by countries?

5.What is the general distribution of research by countries?

The studies were analyzed according to the countries with the most publications. As seen in Figure 8, the top five countries that produced the most publications were the USA (n=4,323), China (n= 2,456), England (n= 1,962), Australia (n= 1,233), and Spain (n=1,129).

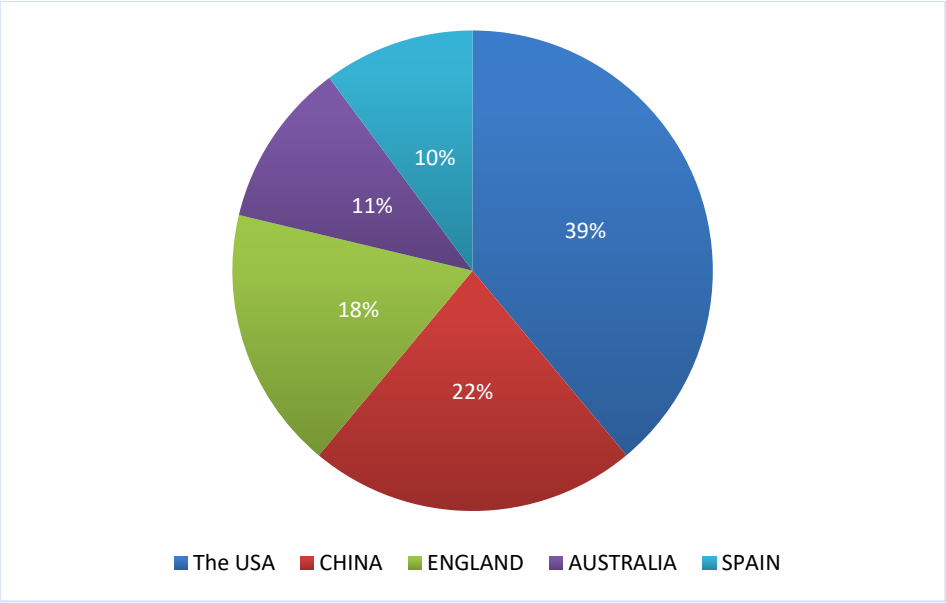


Figure 8. The countries with the most publications

The distribution of the countries of the research conducted in the last twenty years in the world is shown in Figure 9. According to Figure 9, researchers were seen more frequently in America and Europe.

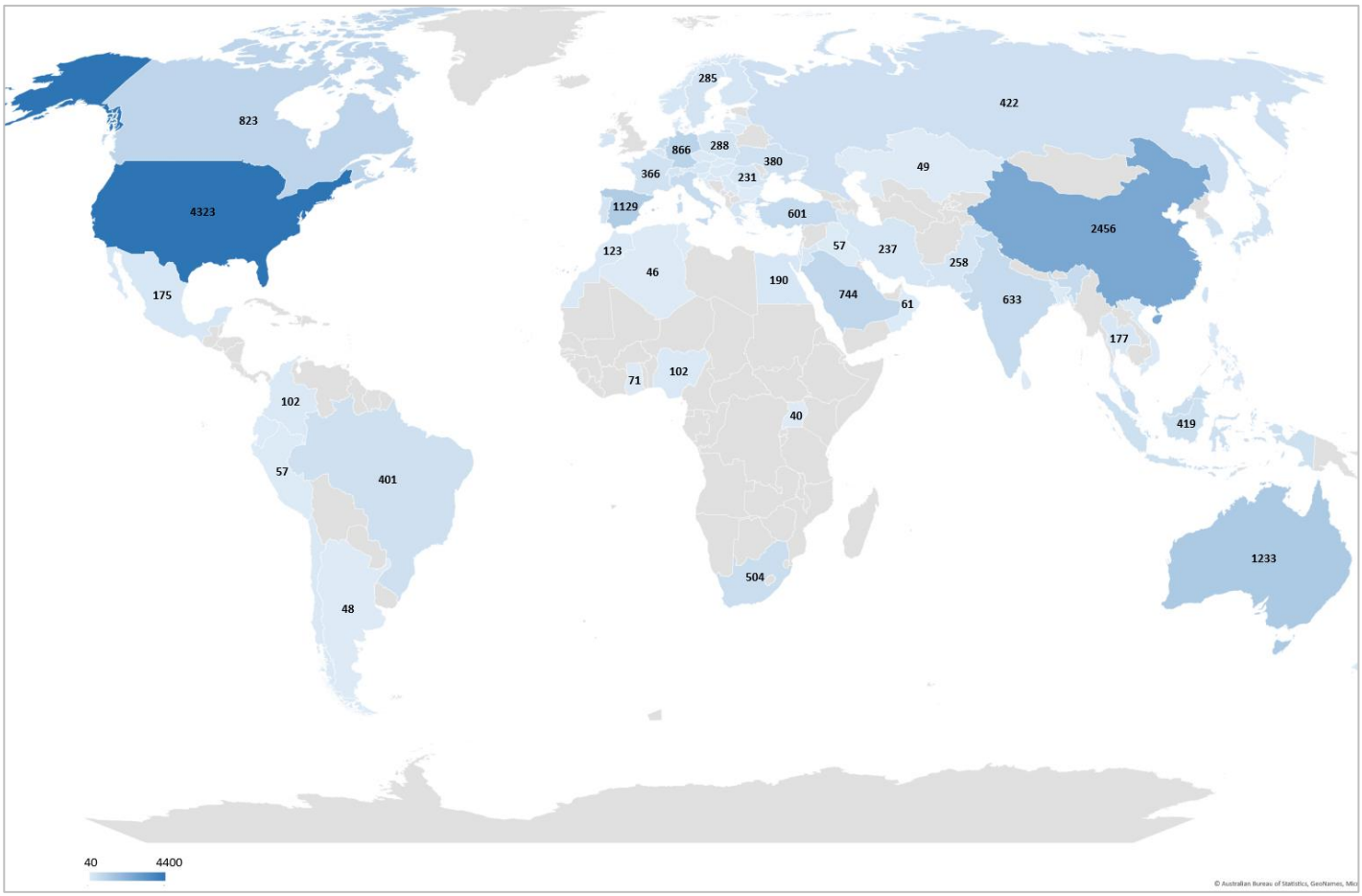


Figure 9. The general distribution of research by countries

6. What is the distribution of the countries where research was conducted by quartiles?

As given in Figure 10, these are the countries that published distance education or online education articles in all quarters: the USA, England, Australia, Spain, Saudi Arabia, Germany, India, Canada, Turkey, Italy, Malaysia, Indonesia, Russia, South Africa, Ukraine, the Netherlands, Brazil, South Korea, Taiwan, Japan, France, Poland, Pakistan, China, Scotland, Portugal, Romania, Switzerland, Sweden, Iran, Ireland, Greece, Finland, the United Arab Emirates, Egypt, Jordan, Norway, Mexico, Israel, Belgium, Singapore, Thailand, Austria, the Philippines, Chile, Czech Republic, and Vietnam. It has been seen that 94 countries started the research in the 2nd quarter; 29 countries started research in the 3rd quarter; and 44 countries started research in the fourth quarter. It was observed that 47 countries conducted research in all quarters.

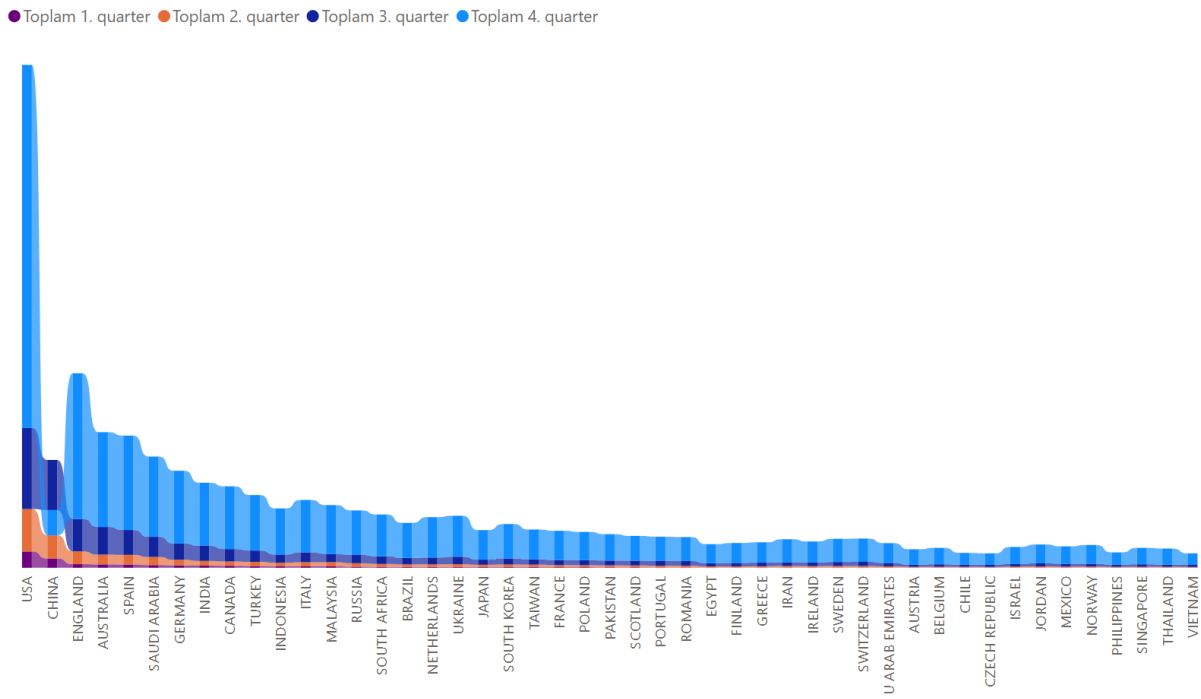


Figure 10. The distribution of the countries where distance education research was conducted by quartiles

What is the distribution of research by organizations?

7. What is the general distribution of research by organizations?

As given in Figure 11, it is seen that the highest number of publications came from University of California System (n=338), N Research Partnership (n=295), University Of London (n=292), Rluk Research Libraries Uk (n=193), State University System Of Florida (n=192), Open University Uk (n=199).

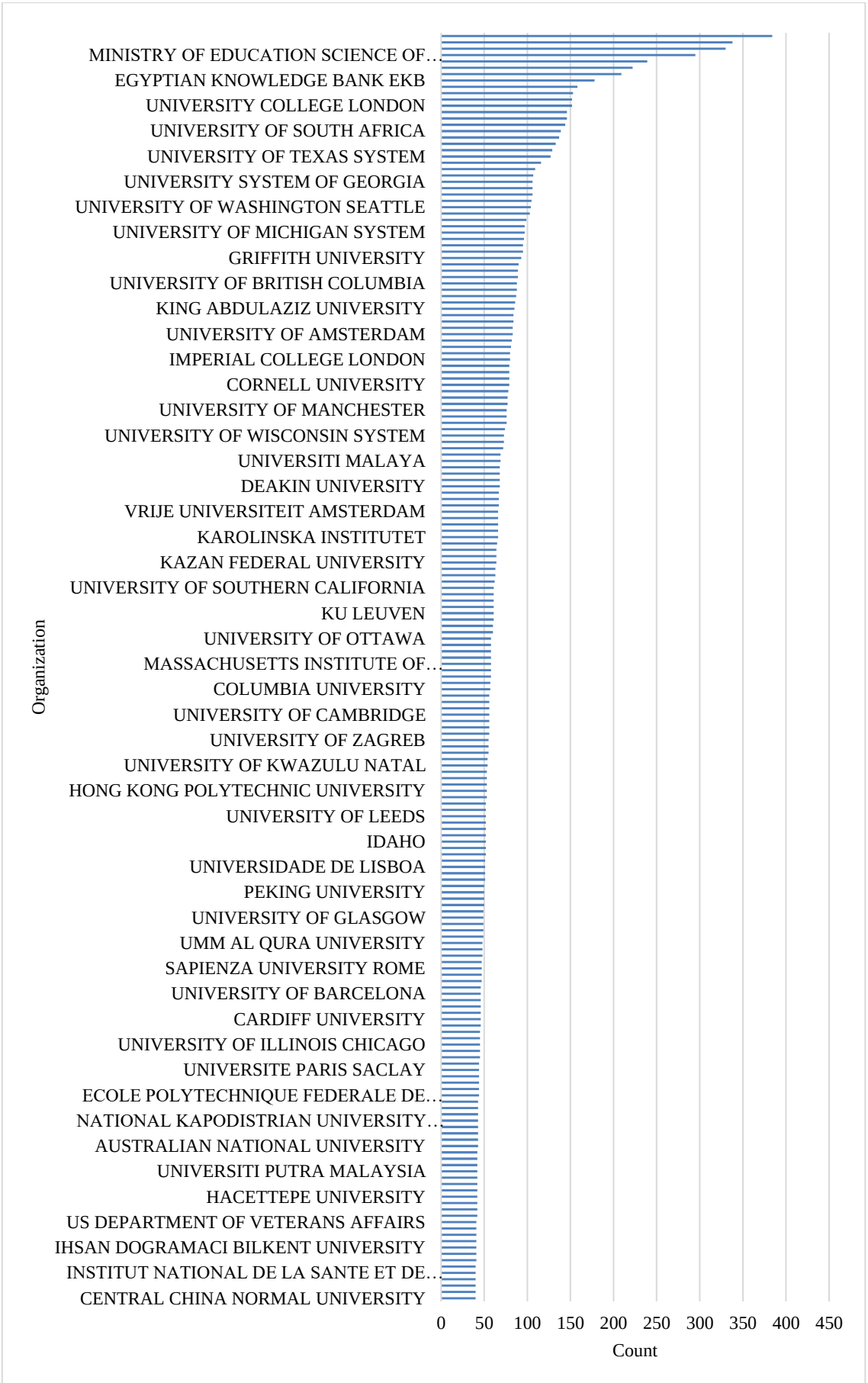
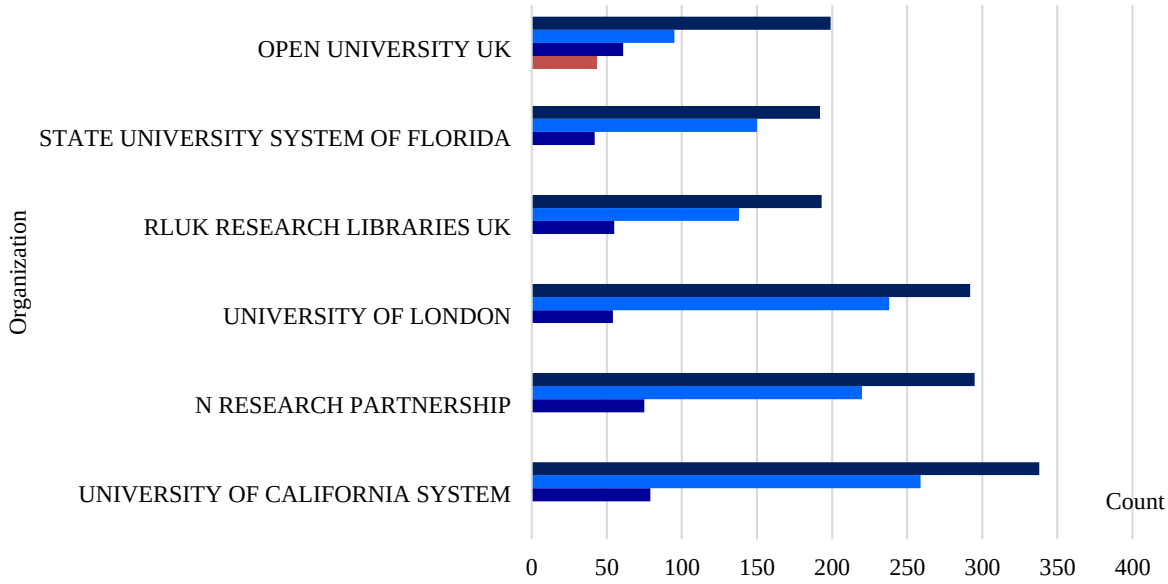


Figure 11. The general distribution of research by organizations

8. What is the distribution of the organizations where research was conducted by quartiles?

When Figure 12 is analyzed, it is seen that the institutions generally published in the 4th quarter. It was found that only Open University UK published in 1st quarter (n=43), 3rd quarter (61), and 4th quarter (n=95). N Research Partnership, University Of London, Rluk Research Libraries UK, and State University System of Florida published in the 3rd quarter and 4th quarter. In total, the University of California System had the highest number of publications (n=338). Although Open University Uk published in all three quarters, its total number of publications lagged behind the other institutions.



	UNIVERSITY OF CALIFORNIA SYSTEM	N RESEARCH PARTNERSHIP	UNIVERSITY OF LONDON	RLUK RESEARCH LIBRARIES UK	STATE UNIVERSITY SYSTEM OF FLORIDA	OPEN UNIVERSITY UK
Toplam	338	295	292	193	192	199
4. quarter	259	220	238	138	150	95
3. quarter	79	75	54	55	42	61
2. quarter	0	0	0	0	0	43
1. quarter	0	0	0	0	0	0

Figure 12. The distribution of the organizations where research was conducted by quartiles

Discussion and Conclusion

In this study, research on distance education in the last twenty years has been analyzed according to years, keywords, countries, and institutions. In addition, these studies were analyzed and compared separately in four quarters. It was observed that the research started to become widespread in 2003 and increased every year. The widespread use of distance education, institutions, and organizations starting to provide in-service trainings remotely (Lundin & Lundin, 2016; Nilsen; 2010 Sezer et al., 2017), and the widespread use of MOOCs (Zhou & Zhang, 2024; Tartuk, 2023; Aljarrah, Ababneh, Karagozlu, & Ozdamli, 2021; Alcarria, 2018; Howard, 2017; Osuna-Acedo et al., 2018; Zawacki-Richter et al., 2018; Bozkurt et al., 2017) can be shown as evidence for this increase. It is a fact that the pandemic period had an impact on the significant increase in the number of studies conducted in the 4th quarter. It can be said that with the transfer of all education processes in many countries to online environments during the pandemic period, many problems or situations were realized and became the subject of research.

The keywords used throughout the studies were online learning, online education, Covid-19, higher education, online teaching, blended learning, medical education, mental health, and training. It was observed that the distribution of keywords used throughout the studies was affected by the keywords used in the studies conducted in the 4th quarter. This is a result of the fact that there are more studies conducted in the 4th quarter than in other quarters. Comparisons have been made in comprehensive studies examining the distribution in general. In this comparison, technology, education, delivery systems, and cloud service were the most frequently used keywords, unlike the study by Dima et al. (2022), which analyzed 637 studies published between 2007 and 2022. In the 1st quarter, the keywords e-learning, distance learning, distance education, online learning, and collaborative learning were frequently used. The use of these keywords led to the possibility that the studies conducted. In the 1st quarter were theoretical studies in which the definition and discussion of distance education and concepts were at the forefront. The keywords used in the 2nd quarter were similar to the 1st quarter, and it was observed that the use of technology, assessment, and pedagogy keywords increased. In the 3rd quarter, the keywords higher education, blended learning, online education, medical education, and MOOCs, which were used differently, showed that the applications in the field of distance education were differentiated. Covid-19, online learning, e-learning, higher education, distance learning, education, online education, distance education, pandemic, and medical education were the keywords with high usage in the last quarter. A comparison was made with studies examining the year range close to this quarter. In this comparison, Gao et al. (2021) analyzed 877 studies between 2019-2021, and the most used words were higher education and Covid-19, similar to this study. Similarly, Hebeci (2021) analyzed 767 studies published between 2020-2021 and concluded that the most used keywords were COVID-19 and distance education. In Tonbuloglu and Akbel's (2023) study, which analyzed 238 studies published between 2020-2021, the most frequently used keywords were pandemic process, distance education, and higher education. However, unlike the study of Gao et al. (2021), mental health was among the most frequently used keywords.

The top five countries where the most research was conducted were the USA, China, England, Australia, and Spain. It has been concluded that the researches are more common in the American and European regions. It was concluded that not all countries conducted research in all four quarters, and there were countries that did not conduct research until the fourth quarter. In Hebeci's (2021) study, although the year range was narrow, the countries with the most research were the USA, the UK, Canada, and China. In Djeki et al.'s (2022) study, which

analyzed 12,272 studies published between 2015 and 2020, Spain, the USA, the UK, China, and Romania were the countries with the most research. Similarly, in Herrera et al.'s (2018) study, the United States, the United Kingdom, Australia, Taiwan, and Spain were the countries that conducted the most research. In the study of Kocdar et al. (2021), the USA, Spain, Germany, China, and Malaysia were the countries with the highest number of publications.In the study of Dima et al. (2022), Serbia, Japan, and Romania were the countries that conducted the most research. In the study of Gao et al. (2021), the countries with the highest number of publications were China, Malaysia, and Saudi Arabia. The reason for this difference may be the year range taken into account in the analysis.

The top five institutions that conducted the most research were the University Of California System, N Research Partnership, the University of London, Rluk Research Libraries UK, the State University System of Florida, and the Open University UK. However, it was observed that these institutions did not conduct research in all quarters. Only the Open University UK has publications in the second, third, and fourth quarters. Unlike Djeki et al., (2022), the institutions with the highest distance education research output were the University Politehnica of Bucharest, University of Hradec Kralove, University of Hong Kong, King Abdulaziz University, and Complutense University of Madrid, University of Technology Sydney, Islamic Azad University, University of Malaya, Universidade Nova de Lisboa, and University of Pittsburgh. In Herrera et al.'s (2018) study, the University of Hong Kong and the National Taiwan University of Science and Technology were the institutions that conducted the most research. The research year criteria included in the analysis in the literature and this study may have caused these results. In Herrera et al.'s (2018) study, Athabasca University, The University of Hong Kong, Pennsylvania State University, The Open University, and the University of Twente were the institutions that conducted the most research between 2003-2007. Between 2012 and 2016, the National Taiwan University of Science and Technology, the National Taiwan Normal University, The University of Hong Kong, the Centre National de la Recherche Scientifique, and the National Central University were the institutions that conducted the most distance education research.

The studies that analyzed similar criteria in the same periods showed similar results. However, it should not be forgotten that analysis studies focus on the subject under investigation. Since 2003, when studies on distance education increased, there have been many events affecting education worldwide. It is a fact that these events have definitely affected education and educational studies. In future analysis studies, these factors can be evaluated together with these factors based on a wide range of years. Distance education is a very broad field. Researchers who will conduct research can examine in detail research on specific topics such as augmented reality, artificial intelligence, and learning analytics in distance education.

Research Ethics

The authors declare that the research has no unethical problems and that they pay attention to research and publication ethics.

Contribution Rate of Researchers

The authors declare that they contributed equally to each stage of the study

Conflict of Interest

The authors declare that the study has no conflict of interest.

Funding

The authors declare that they did not receive any research funding for this study.

The Ethical Commitee Approval

The authors did not obtain any ethics committee approval for this study. The reason for this is that this study is a bibliometric study.

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