

# Research Trends in the Field of Emergency Remote Teaching: A Bibliometric Analysis of Open Access Literature

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## Abstract

Throughout the period of pandemic, many studies have been conducted on emergency remote teaching (ERT) in different fields and from different perspectives, which reveal that there has been a lack of a comprehensive map showing the rapid and continuous responses of these studies to the process. The purpose of this research is to analyze open access research on ERT using bibliometric method, and to reveal current trends in this field. VOSviewer software was used for data analysis; the data collection process was shaped using the PRISMA framework. 238 studies were included in the analysis. The distribution of the open access studies analyzed in the field of emergency remote teaching by year, type of publication, subject, country, and sources was examined; citation analysis (by journal and publication), authorship patterns and collaboration, common word analyses are included. It was found out that these open access publications mainly consisted of journal articles and were dated 2020 and 2021; most of the publications were in the field of educational sciences. Based on common word analysis, the most important topics that are addressed in studies on the ERT process are the process of pandemic, distance education and higher education, while the challenges experienced regarding teachers and pedagogic issues during the process, teacher education, student-related characteristics (such as self-regulated learning-motivation-academic success) and participation are found to be frequently studied topics. The concepts of instructional design, collaborative learning, social presence, and assessment are also among the topics covered. It is anticipated that the implications for policy and practice based on the examination of research trends will have a significant effect on the structuring of future online learning environments, as well as the ERT designed for emergencies.

*Keywords:* Emergency remote teaching, bibliometrics, citation analysis, common word analysis, Covid-19

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Rapid, global advances in the development of technology have made a substantial impact on education. As information technologies develop and become more widespread, the way we learn and teach is also changing. Remote teaching, as a flexible education model in which technological opportunities can be used, is widely applied in various fields of education (Larreameydy-Joerns & Leinhardt, 2006; Avcı Akbel, 2021). Online learning is defined as a form of education that is given in an environment using the internet with the aim to learn the content through synchronous or asynchronous learning activities and is not dependent on the physical or virtual location of the student (Singh & Thurman, 2019). Well-designed online learning environments offer different potential benefits such as accessibility, affordability, flexibility, quality, and equity (Castro & Tumibay, 2021; Littenberg-Tobias & Reich, 2020). Effective design of online learning environments requires considering a variety of factors and long range planning. In order to obtain effective results with different parameters such as success, performance, and attendance rate, it is crucial to configure online learning environments by taking numerous factors into consideration: pedagogy, technology, interface design, evaluation, management, resource support, and ethical and institutional considerations (Khan, 2005), as well as the self-regulated learning skills of students in online learning environments (You, 2016), strategies that encourage interaction and socialization (Garrison & Arbaugh, 2007), and types of feedback (Cavalcanti et al., 2021).

The rapid transition of educational institutions all over the world to online education has prompted scientists to explore factors related to design, delivery, and evaluation of instruction provided during the pandemic. The online training provided to continue education during the COVID-19 pandemic was named Emergency Remote Teaching (ERT) by Hodges et al. (2020), who suggested that courses delivered online in response to a crisis or disaster are significantly different from well-planned, online learning experiences and that institutions are expected to acknowledge such differences. The rapid response of the research communities to learning activities during the pandemic has promoted the development of a broad knowledge of online learning practices in higher education during that period (Zhang et al., 2022).

### **Emergency Remote Teaching (ERT)**

The COVID-19 pandemic has led to an unprecedented crisis across the world, fueling discussions on distance education; major effects of the pandemic have been experienced in the field of education as well as in many areas of life. With the outbreak of COVID-19, countries had to suspend face-to-face classes in educational institutions. During this process, universities and schools were closed for an indefinite period in some countries to prevent the spread of the disease (Thakur, 2020; Vandy, 2021). The closure of educational institutions and the quarantine process in many countries was soon followed by the beginning of virtual or digital education processes (Daniel, 2020). The transition to ERT usually shocked institutions, teachers, and students (Rapanta et al., 2020), which led to the inevitable need to explore new ways for teaching and learning (Abel, 2020). The educational practices during this process are usually expressed by using various terms such as distance education, e-learning, and online education; however, these terms do not fully reflect the process implemented during the COVID-19 interruption. Distance education could not be carried out fully in line with all the requirements during the pandemic, (Golden, 2020; Hodges et al., 2020; Shisley, 2020); therefore, it might be more accurate to name the period as “emergency remote teaching (ERT)”, (Hodges et al., 2020). As explained by Bozkurt et al. (2020), there is a notable difference between ERT and distance education; the former is a necessity while the latter is an option. Unlike distance education, which involves a

long process of planning and creating an educational program, ERT involves continuation of education temporarily and within the means available (Akkoyunlu & Bardakcı, 2020; Bozkurt et al., 2020, p.117; Hodges et al., 2020; Tonbuloğlu, 2021). Distance education activities are configured after long processes of construction with a systematic design and development model and through a careful process of instructional design (Branch & Dousay, 2015). ERT, aims to provide temporary access to the teaching environment to prevent disruption of educational activities due to situations such as disaster, crisis, etc. (Bozkurt, 2020; Ercan and Künç, 2020; Rahiem, 2020). The rapid approach required for ERT arising from the need to bring classes online may reduce the quality of classes provided, so it is recommended that the temptation to equate ERT with online learning should be avoided (Hodges et al., 2020). In addition, it is emphasized that standard institutional policies and teaching assessment practices should be altered for ERT (Hodges et al., 2020). A good example of this is the report titled “Guidance for Interruptions of Study Related to Coronavirus (COVID-19)” published by the US Department of Education in 2020.

### **Bibliometric Analysis**

Effective research is conditional on an awareness of previous research and technologies. Various methods are employed to analyze research. One of these methods is bibliometric analysis. As a concept, bibliometrics refers to the analysis of books, articles, and other media of scientific communication using mathematical and statistical techniques (Pritchard, 1969, p.368; Thelwall, 2008). Bibliometric analysis is a technique that helps provide an overview of the academic literature (Van Nunen et al., 2018, p. 248). Bibliometric studies are employed for a variety of purposes, such as identifying the latest developments, research directions, main topics (Wang et al., 2014), general reviews, and analyses by leading researchers (Bjork et al., 2014). The use of bibliometric methods to identify general trends in any field or subject in different disciplines is becoming increasingly common. (Bornmann & Mutz, 2015; Hallinger & Suriyankietkaew, 2018). The bibliometric analysis method is widely used for quantitative analysis of the literature (Chai & Xiao, 2012), providing a broader perspective to any specific field by mapping the characteristics and development of scientific outputs in that field (Li & Hale, 2016). The increasing use of the method reveals the connections between scientific studies by mapping them with the help of journals, documents, authors, institutions, descriptive terms and words, and the methods makes it possible to analyze hundreds or even thousands of studies (Zupic & Cater, 2015). The bibliometric analysis method allows the researcher to obtain information about a general view of the studies related to the field of research, the studies focused on by the researchers and the structure of the datasets in the field, and to make the utmost use of visual mapping. The literature contains many studies performed in bibliometric design in the field of education (Diem & Wolter, 2013; Ivanović & Ho, 2019; Karaköse & Demirkol, 2021; Köseoğlu & Bozkurt, 2018; Lopes et al., 2017; Zancanaro et al., 2015; Gülmez et al., 2020; Hallinger, Gümüş & Bellibaş, 2020; Marti-Parreño et al., 2016).

### **Citation Analysis**

Bibliographic data obtained from databases such as Scopus and Web of Science can be analyzed by various bibliometric analysis methods such as citation analysis, co-author analysis, co-citation analysis and co-word analysis. Citation analysis is one of the best-known and most used analytical tools in bibliometric analysis, which focuses on published citations (Gülmez et al., 2020). Citation counts indicate the importance of research as effective research is frequently cited (Thelwall, 2007). The analysis of citations in journals is considered among impact factors of

the journals (Garfield, 1999). Therefore, citation analyses of documents, authors, journals, institutions, and countries are frequently searched in bibliometric studies, whereby effectiveness and efficiency analyses are performed.

### **Co-word Analysis**

Co-word analysis determines the relatedness of items according to the number of documents in which they co-occur. Co-word analysis is a bibliometric analysis technique that helps create a conceptual structure and establish relationships using keywords in the analyzed documents (Gülmez et al., 2020). The technique involves focusing on the co-occurrence analysis of words and enables creation of semantic maps that facilitate the understanding of the cognitive structure of a field. Information is presented by way of using the most important words or keywords of the documents to explain how knowledge is organized in a scientific discipline and to examine the conceptual structure of the research field (Callon et al., 1983; Lee and Jeong, 2008). Co-word analysis is widely preferred as it uses the actual content of documents to establish a similarity measure (Aria & Cuccurullo, 2017). Co-occurrence analysis of keywords or terms in the selected literature makes it possible to identify interrelated item groups and map the dynamics of science (Tan et al., 2004; He, 1999).

Titles of the analyzed texts, keywords, abstracts, or full texts can be used in co-word analysis. The following steps are needed to perform co-word analysis: First, keywords are extracted and normalized, then the structure of their co-occurrence matrix is identified, keywords are clustered, and visual presentation of keyword sets is performed (Lee and Jeong, 2008). Cluster analysis is a technique that allows review of themes shared in studies based on the relatedness between scientific studies examined and assumes that articles in the same clusters discuss similar research topics (Kaufman & Rousseeuw, 2009). Accordingly, it may be deduced in the co-word analysis that there are strong relationships between studies in the same cluster, while studies in distant clusters are weakly related.

### **Text Analysis of Abstracts**

Text analysis of abstracts involves computer-aided analysis of data in a large collection of written texts (Wegerif & Mercer, 1997). Basic steps of text analysis are listed as follows: data selection, corpus creation, data cleaning, computer aided analysis and interpretation of results (Popping, 2000). For the datasets to provide accurate results in text analysis, it is important to specify the synonyms file to be created for the data cleansing process and the terms that have similar meanings. Additionally, removing unnecessary sections that may affect the results of the research, such as section labels and copyright statements, which are commonly used in structured abstracts, are important for the consistency of the information to be presented by the data set. When text analysis is based solely on keyword analysis, there may be limitations in cases where the person indexing the document does not extract the relevant parts from the text or the bibliographic data of the journal does not include keywords (Zupic & Cater, 2015). Such limitations can be eliminated through text analysis of the abstracts.

## **Review of Relevant Literature**

The effects of the pandemic still linger, and research and applications related to ERT presented during the pandemic are developing rapidly. However, even though many studies have been conducted on ERT in different fields and perspectives during the 2-year pandemic process, a comprehensive map showing the rapid and continuous responses of these studies to the process

does not exist. To provide an overall picture of the existing situation and ensure discovery of meaningful knowledge, it is important to examine many studies on the subject using various analytical methods and to perform classification, clustering, summarization, and visualization. The topic of how online teaching was implemented in the COVID-19 period has been addressed by several studies in the form of systematic literature review (Abu Talib et al., 2021; Turnbull et al., 2021; Bond et al., 2021; Bhuwandeep & Piyusa Das, 2020; Bond, 2020; Sezgin, 2021; Stewart, 2021), yet the analyses mostly included articles and empirical studies published in higher impact journals. Bibliometric studies designed to analyze subjects in the field of online education, trends of the subjects and relations between the subjects within the framework of an extensive literature are numerous in the field of distance education yet limited in number in the field of ERT (Amoozegar et al., 2018; Bozkurt & Zawacki-Richter, 2021; Pinto-López & Montaudon-Tomas, 2021; Yavuz et al., 2021) and e-learning (Cheng et al., 2014; Chiang et al., 2010; Fatima & Abu, 2019; Gupta & Dhawan, 2020; Harande & Ladan, 2013; Hung, 2012; Tibaná-Herrera et al., 2018a; Tibaná-Herrera et al., 2018b).

A review of the studies using bibliometric analysis to examine online education practices in the COVID-19 period demonstrates divergence between the focal points and research contexts of those studies. For example, Rodrigues et al. (2020) built their work on the mapping of the publications reviewed in management and education, aiming to identify the most studied topics from the management perspective during the COVID-19 period. There are also studies that examine the trends of scientific publications within the context of higher education during the pandemic by using the bibliometric method (González-Zamar et al., 2020; Zhang et al., 2022). Yaacob and Gan (2021) conducted research on the effect of technology during the COVID-19 period using bibliometric analysis. Although all those studies examined online education using bibliometric analysis, they constructed their analyses in different contexts such as management, higher education, and technology.

A review of bibliometric studies by methodology reveals that some of the studies analyzing online education research conducted during the pandemic used PubMed and WHO (Chahrour et al., 2020) databases, while others used the Scopus database (Darsono, 2020; Dehghanbanadaki et al., 2020) and Web of Science database (Al-Zaman, 2020; Kaya & Erbay, 2020; Mishra, 2021). All those searches were generally structured to cover online education practices conducted during the pandemic, and there was no limitation in the context of research specifically using the term ERT. The research aims to analyze the trends of research carried out specifically on the concept of ERT, which is based on the structural difference between ERT and online education. Online education during the Covid 19 period was named ERT in relevant studies; this nomenclature manifests that the process is regarded as “a necessity rather than an option,” “a temporary phase,” and “a means to provide temporary access to the teaching environment for the continuation of education within the realms of possibility” (Akkoyunlu & Bardakcı, 2020; Bozkurt et al., 2020; Hodges et al., 2020; Ercan & Künc, 2020; Rahiem, 2020), and that the online education practices in the COVID 19 process were addressed and interpreted within this framework. Moreover, the use of the term ERT in the research is an acknowledgment of the failure to fully implement distance education during the pandemic in conformity with all requirements (Golden, 2020; Hodges et al., 2020; Shisley, 2020). ERT is addressed separately from online learning, and practices such as bending the standard institutional policies and assessment activities for ERT are considered justifiable (Hodges et al., 2020). Thus, that process may be viewed from a more scientific perspective. Within this context, this research aimed to analyze the trends in research in which the concept of ERT is used as online education studies in the COVID 19 process. answers are sought to the following questions:

As for the **analyzed studies** on ERT, answers are sought to the following questions:

1. How is their distribution by year?
2. How is their distribution by type of publication?
3. How is their distribution by discipline?
4. How is their distribution by country?

As for **journals** in this field, answers are sought to the following questions:

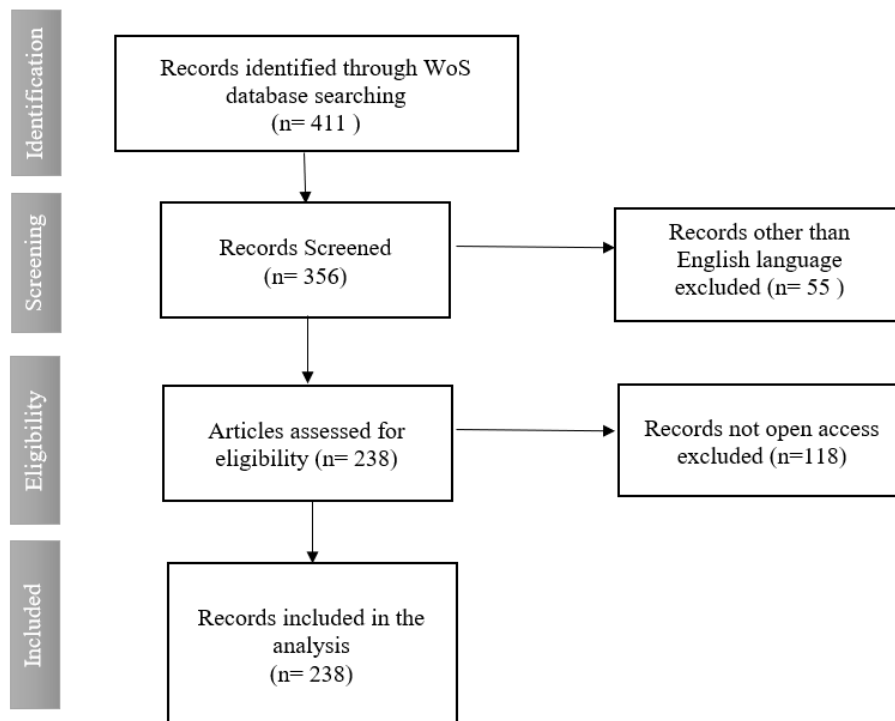
1. Which of them have the highest levels of productivity?
2. Which of them have the highest citation count?
3. What are the authorship patterns and degrees of collaboration established in this
4. field?
5. Which patterns and meanings can be obtained from the keyword analysis?
6. Which patterns and meanings can be obtained from the analysis on abstracts of research papers?

## Method

### Data Collection Process

Web of Science (WoS) database, an online database in which journals, conference proceedings, and book chapters are indexed, was used for the selection of the papers to be examined in the scope of this research. This database was chosen as it allows viewing of articles of acceptable quality in the SCI-EXPANDED, SSCI, ESCI, CPCIS, BKCI-S, CPCI-SSH and BKCI-SSH indexes (Akhavan et al., 2016; Amoozegar, 2018), it has a wider historical scope than Scopus (Balstad & Berg, 2020), and offers a wide index covering all scientific fields (Zawacki-Richter & Naidu, 2016). The publication review using logical operators and keywords is shaped in line with the PRISMA framework (Page et al., 2020).

**Figure 1**  
*Selection of Papers: PRISMA Approach*



A search was performed on WoS database on 14.12.2021. The terms “emergency remote teaching,” “emergency remote instruction,” “emergency remote education,” “emergency remote learning,” “emergency distance instruction,” “emergency distance education,” “emergency distance teaching,” “emergency distance learning,” “emergency online instruction,” “emergency online education,” “emergency online teaching,” and “emergency online learning” were search using the OR logical operator; 411 results were found. When only the records in English language were filtered, the remaining records (n= 356) were searched, and open access records were filtered (n= 238) and included in the analysis.

### Analysis of Data

In the analysis of the data, distribution analyses of the publications by year, publication type, and discipline were carried out on the data provided by WoS. VOSViewer Version 1.6.2 (Van Eck & Waltman, 2014) software was used for bibliometric analysis. Bibliometric data of 238 documents obtained on WoS were uploaded to the VOSViewer software and analyzed. In this frame, the most cited papers, authors, journals, as well as countries and journals with the highest number of publications were analyzed; authorship patterns and degrees of collaboration established in this field were investigated, and common word analyses were used. Common word analysis, a commonly preferred technique in bibliometric research, is used to explain how information is organized in a scientific discipline (Lee & Jeong, 2008) and to map the dynamics of science based on co-occurrence patterns of keywords (He, 1999). *Text analysis* is a computer-aided analysis of data in a large collection of texts (Wegerif & Mercer, 1997). Text analysis basically includes the following steps: data selection, corpus creation, data cleaning, computer-

aided analysis, and interpretation of results (Popping, 2000). Within the scope of this research, the related data were reviewed, and synonyms (thesaurus) files were created prior to the analysis of keywords and summary texts; repetition of words with identical or similar meanings was so prevented.

To analyze the distribution of publications by country, the Relative Citation Impact (RCI) value, which refers to the share of a country in total citations according to the global total and is calculated by dividing the total citation percentage of a country by the total publication percentage, was also included in the analysis. Subramanyam’s (1983) formula was used to calculate the degree of cooperation between the authors; the degree of collaboration was determined by calculating the ratio of the number of papers by multiple authors published in a discipline within a certain period to the total number of papers.

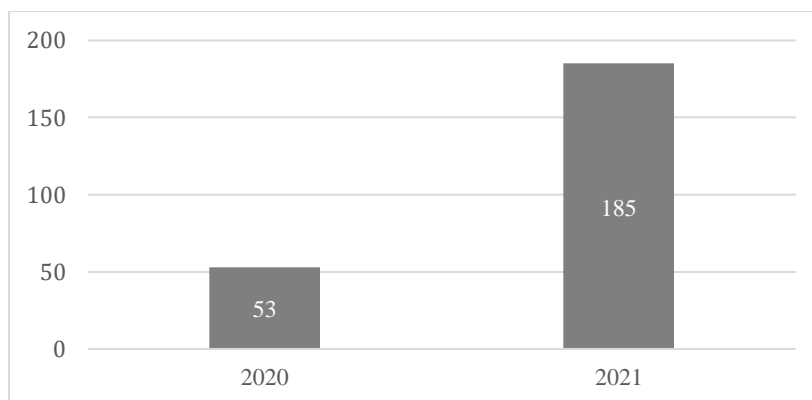
## Findings

### Distribution of Publications by Year

A review of the year-wise distribution of publications on ERT demonstrates that the publications belong only to the years 2020 and 2021, and there has been a significant increase in the number of publications in 2021 with the continuing impact of the COVID-19 pandemic. It has been found out that the terms “emergency remote/distance/online learning/ teaching/ instruction/ education” were not used in the keywords, titles, and abstracts of scientific studies before the year 2020. This result is normal when we consider the fact that the term ERT was introduced to the literature by Hodges in 2020.

### Figure 2

*Distribution of Publications by Years*

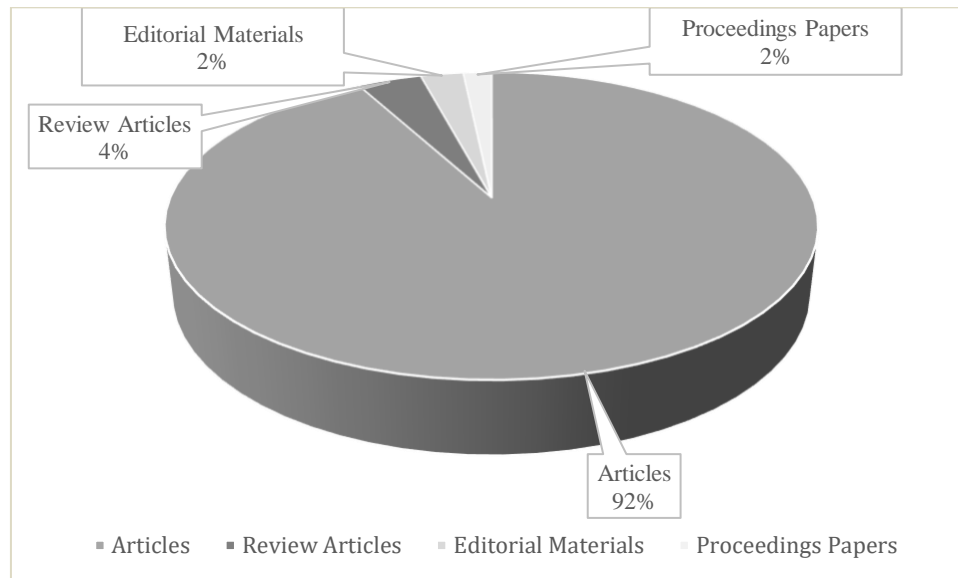


### Distribution of Publications by Type

A review of the distribution by publication type demonstrates that 92% of the publications (219 publications) are journal articles, followed by review papers that cover 4% (9 publications) (Figure 2). There are also limited number of editorial materials and conference proceedings on ERT.



**Figure 3**  
*Distribution by Publication Type*



**Distribution of Publications by Subject**

When the distribution of publications is analyzed by subject (Table 1), it is observed that most of the publications are in the field of educational sciences (51%), which are followed by environmental sciences (18%), and medicine and health sciences (13%). Many of the publications is listed in more than one category.

**Table 1**  
*Distribution of Publications by Subject (Many publications have more than one subject category)*

Subject area	No. of documents	%
Educational Sciences	157	51%
Environmental Sciences	55	18%
Medicine and Health Science	39	13%
Social Sciences	27	9%
Other	10	3%
Biological, Physics & Chemical Science	8	3%
Engineering	8	3%
Computer	3	1%
Math	2	1%

**Distribution of Publications by Country**

The top ten countries that have made significant contributions to studies on ERT are presented in Table 2. It has been found out that studies on this subject have been carried out in 67 countries across the world, with the USA accounting for the highest number of publications and citations (25% of total publications, 28% of total citations). In terms of the number of publications, the USA is followed by Spain (7%) with 17 publications, England (7%) with 16

publications, People’s Republic of China (5%) with 12 publications, and South Africa (5%) with 11 publications, respectively. In terms of the number of citations, the USA (350 citations) was followed by Cyprus with 128 citations, Canada with 86 citations, Spain with 64 citations and Oman with 58 citations, respectively. RCI value denotes a country’s share of total citations worldwide and is obtained by dividing a country’s total citation percentage by the total publication percentage (Sahoo & Pandey, 2020). RCI value has been used as one of the parameters to show country productivity (Mishra et al., 2021). When the RCI is above 1, it means that the relevant country’s citation rate is higher than the world citation rate. Table 2 shows that in the top ten countries with the highest citation rate, only the US and Canada have higher citation rates than the world citation rate.

**Table 2**  
*Distribution of Publications and Citations by Country*

Country	No. of documents	%TP	TC	%TC	TC/P	TLS	RCI
US	59	25%	350	28%	5,9	3599	1,11
Spain	17	7%	64	5%	3,8	1948	0,70
England	16	7%	30	2%	1,9	2667	0,35
Peoples R China	12	5%	24	2%	2,0	1607	0,37
South Africa	11	5%	4	0%	0,4	709	0,07
Canada	9	4%	86	7%	9,6	1064	1,79
Mexico	9	4%	19	1%	2,1	1071	0,40
Turkey	9	4%	14	1%	1,6	1626	0,29
Germany	7	3%	35	3%	5,0	1206	0,94
Japan	7	3%	14	1%	2,0	901	0,37

*TP: Total Publications, TC: Total Citations, TLS: Total Link Strength, TC/P= citations per paper, RCI: Relative Citation Impact*

**Journals with Highest Levels of Productivity and Citation Count**

Journals with publications regarding ERT are listed according to productivity and citation count; Journal Impact Factors (JIF), JCI and JCI Q values of the journals are also included, along with the total number of publications and citations, the number of citations per article, and the total link strength. JIF, one of the metrics provided by Journal Citation Reports (JCR) that presents publisher-independent data and statistics, is a value that measures the journal-level metrics calculated based on WoS indexed data and is used to measure the scientific impact of journals. Table 3 demonstrates that the journals with the highest number of papers in this field are Education and Information Technologies, the official journal of the IFIP Technical Committee on Education, and *Education Sciences* and *Sustainability* journals, which are among the open access journals published by MDPI. A review of the subject areas of the top 10 journals with the highest productivity demonstrates that the subject areas of the journals mostly include educational sciences, in line with the information in Table 1, and there are also journals in fields of environmental sciences, medicine and health sciences.

**Table 3**  
*Most Productive Journals*

Journals	No. of documents	%TP	TC	%TC	TC/P	TLS	JIF (5 Year)	JCI	JCI Q
<i>Education and Information Technologies</i>	17	7%	23	2%	1,4	1674	2.953	1.82	Q1
<i>Education Sciences</i>	17	7%	62	6%	3,6	1528	N/A	1.03	Q2
<i>Sustainability</i>	17	7%	53	5%	3,1	1635	3.473	0.56	Q3
<i>Online Learning</i>	10	4%	101	10%	10,1	617	N/A	1.32	Q1
<i>Frontiers in Education</i>	9	4%	12	1%	1,3	602	N/A	N/A	N/A
<i>Frontiers in Psychology</i>	9	4%	8	1%	0,9	937	3.618	0.93	Q2
<i>British Journal of Educational Technology</i>	5	2%	14	1%	2,8	570	5.030	3.16	Q1
<i>Information and Learning Sciences</i>	5	2%	9	1%	1,8	67	N/A	0.4	Q3
<i>International Journal of Educational Technology in Higher Education</i>	5	2%	7	1%	1,4	646	5.361	2.7	Q1
<i>ETR&amp;D: Educational Technology Research and Development</i>	4	2%	10	1%	2,5	125	4.500	2.31	Q1

TP: Total Publications, TC: Total Citations, TC/P= citations per paper, TLS: Total Link Strength.

[JIF: Journal Impact Factor, JCI: Journal Citation Indicator, JCI Q: JCI Quartile (Source: Journal Citation Reports™ 2020, Date: 17.05.2022)]

Table 4 shows the most cited journals. *Interactive Learning Environments* was the most cited journal with an article, which is followed by *Online Learning* and *Education Sciences*. It has been observed that there are only 3 journals in common (*Online Learning*, *Education Sciences* and *Sustainability*) in the list of both the most productive and most cited journals.

**Table 4**  
*Top 10 Journals with the Highest Number of Citations*

Journals	No. of documents	%TP	TC	%TC	TC/P	TLS	JIF (5Year)	JCI	JCI Q
<i>Interactive Learning Environments</i>	1	0%	126	12%	126,0	115	3.868	2.05	Q1
<i>Online Learning</i>	10	4%	101	10%	10,1	617	N/A	1.32	Q1
<i>Education Sciences</i>	17	7%	62	6%	3,6	1528	N/A	1.03	Q2
<i>Journal of Business Research</i>	1	0%	60	6%	60,0	48	8.488	1.87	Q1
<i>Sustainability</i>	17	7%	53	5%	3,1	1635	3.473	0.56	Q3
<i>Children and Youth Services Review</i>	3	1%	40	4%	13,3	570	2.944	1.14	Q1
<i>Societies</i>	1	0%	39	4%	39,0	77	N/A	0.63	Q3

<i>Innovative Infrastructure Solutions</i>	1	0%	38	4%	38,0	63	N/A	0.42	Q3
<i>American Journal of Pharmaceutical Education</i>	2	1%	37	4%	18,5	7	2.789	0.62	Q2
<i>Journal of Education for Teaching</i>	2	1%	34	3%	17,0	6	2.528	1.29	Q1

*TP: Total Publications, TC: Total Citations, TC/P= citations per paper, TLS: Total Link Strength [JIF: Journal Impact Factor, JCI: Journal Citation Indicator, JCI Q: JCI Quartile (Source: Journal Citation Reports™ 2020, Date: 17.05.2022)]*

### Authorship Patterns and Collaboration

When we examine the analyzed records within the scope of authorship patterns and collaboration, we see that 37 documents (15%) were published by single authors, while the remaining 201 documents (85%) were published by multiple authors. Table 5 demonstrates that multi-authoring prevails in this subject area, and collaborative research is common.

**Table 5**

#### *Authorship Pattern*

<b>Type of authorship</b>	<b>No. of publications</b>	<b>%</b>
Single author	37	15
Two authors	56	23
Three authors	46	19
Four authors	32	13
Five authors	29	12
More than 5 authors	38	15

Subramanyam’s (1983) formula was used to identify the degree of collaboration between the authors. For this purpose, the ratio of the number of multi-authored articles published in a discipline to the total number of articles published within a certain period was calculated. The formula is:

$$\text{Degree of collaboration} = \frac{\text{Number of studies by multiple authors}}{\text{Number of studies by multiple authors} + \text{Number of studies by single author}}$$

The degree of collaboration was found to be 0.84 based on this formula. The degree of collaboration between the authors between the years 2013 and 2017 was 0.93 according to the bibliometric study on e-learning by Fatima and Abu (2019), and 0.81 according to Mishra et al. (2021). Consequently, we observe that this research finding is in harmony with the results of other bibliometric studies in which multi-authoring predominates.

### Thematic Clustering Analysis Based on Keywords

Thematic clustering analysis based on keywords was conducted to explore the key concepts in the publications analyzed. To generate a cluster map, VOSviewer (Van Eck & Waltman, 2014) was used and a minimum occurrence threshold of 3 was determined. 34 out of 640 keywords met the occurrence threshold. As given in Figure 4, those keywords were divided into clusters based on their co-occurrence with other keywords and their total link strength.

**Figure 4**  
Clustering of Keywords Using VOSviewer

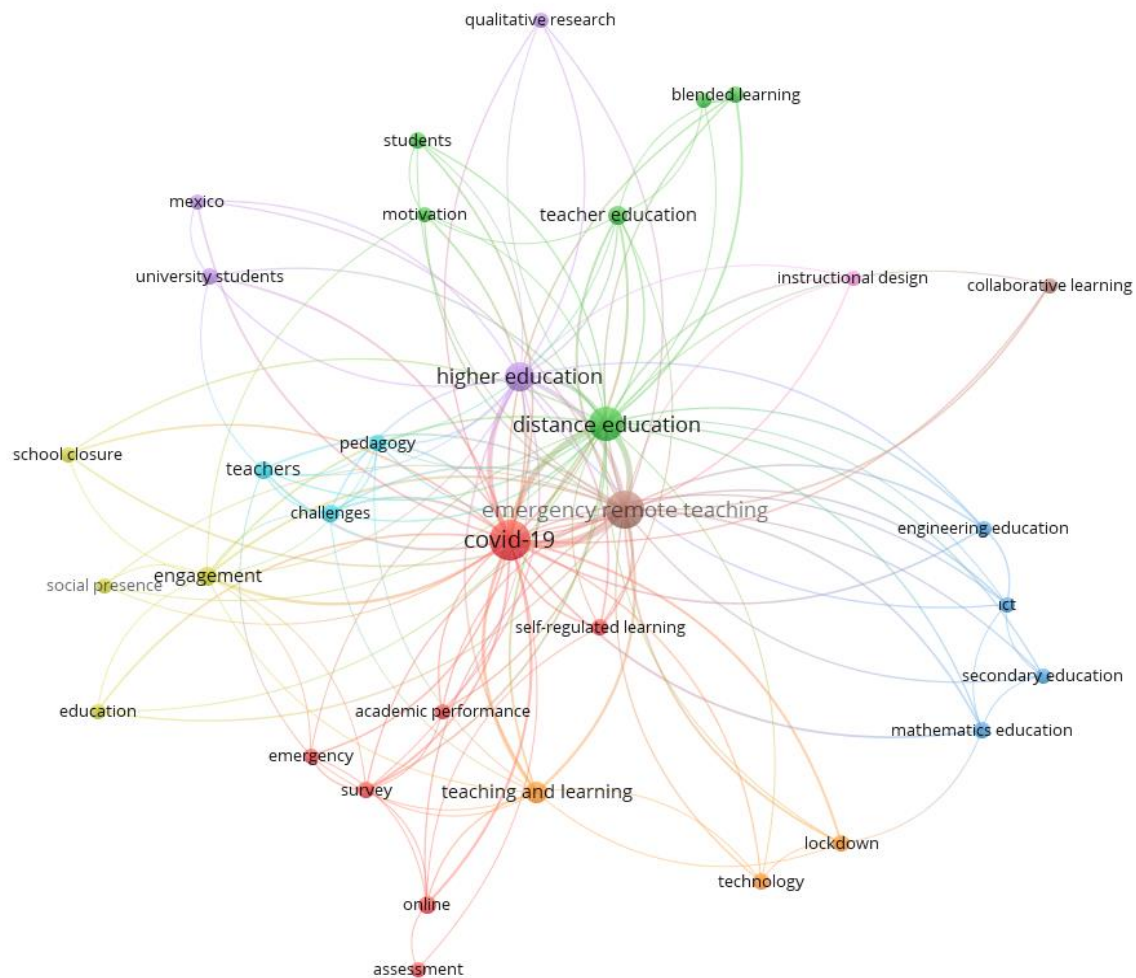


Figure 4 presents 9 clusters formed. Size of the bubble indicates the strength of the keywords in terms of their frequency, association, and influence. When the keywords covered by the clusters are reviewed, they present the following themes:

***Academic Process and Assessment***

The red cluster consisting of 7 keywords contains the terms *Covid-19*, *assessment*, *self-regulated learning*, *academic performance*, *emergency*, *online*, and *survey*. We consider that mainly academic performance and assessment activities during the pandemic are examined in this cluster. The keyword *Covid-19* stands out in this cluster with a higher strength of frequency, association, and influence. It is also seen near the center of the figure, which demonstrates that this keyword is also among the concepts frequently used in other fields. Furthermore, the keyword *self-regulated learning* is close to the center in this cluster, which indicates that the

concept is commonly used and has significance in the process. It is understood that surveys are frequently used in the studies.

### ***Teaching and Technology***

The keywords *quarantine*, *teaching and learning*, and *technology* are found together in the orange cluster. As concluded from this cluster, studies addressing the relationship between technology and teaching & learning activities during the lockdown period are intense. The keyword *teaching and learning* is close to the red cluster, which indicates that the words in the red cluster are often studied together.

### ***Disciplines***

The blue cluster contains the words *engineering education*, *information technologies*, (*ICT*), *mathematics education*, and *secondary education*. We think that this cluster generally represents the disciplines in the ERT process. It can be concluded that the fields of engineering and mathematics education and information technologies are closely related in the ERT process, and that studies on secondary education are related to mathematics education and information technologies.

### ***Higher Education***

The purple cluster contains the keywords *higher education*, *university students*, *qualitative research*, and *Mexico*. Particularly the keyword *higher education* is seen to have a higher frequency, association, and influence and a position close to the center of the map, which demonstrates that studies on higher education are predominant, and this concept is often studied together with other keywords. Moreover, we acknowledge that qualitative research methods are commonly preferred in the studies.

### ***Collaborative Learning***

The brown cluster contains the keywords *emergency remote teaching* and *collaborative learning*. These two keywords are within the same cluster, which is worthy of note in the sense that it underlines the importance of collaborative learning in ERT practices and points out to the communities of inquiry in online learning used in online education. The keyword *emergency remote teaching* in the brown cluster is observed to have a higher frequency, association, and influence than the others, and this keyword is centrally positioned which demonstrates associations with this keyword are common in other studies.

### ***Instructional Design***

The fact that the keyword *instructional design* in the pink cluster is among the keywords repeated in the studies on ERT process points out to the importance of this concept in the process.

### ***Distance Education and Professional Development***

We see that there are 6 keywords in the green cluster: *blended learning*, *distance education*, *motivation*, *professional development*, *teacher education*, and *students* and the keyword *distance education* has higher frequency, association, and influence than the others. Particularly the keywords *teacher education* and *professional development* are included in this cluster, which demonstrates the significance of distance education studies in lifelong learning activities. It is further acknowledged that motivation is a crucial component frequently addressed

as a topic of study in distance education activities, and blended learning is also among the areas of focus in the studies.

### ***Socialization***

The yellow cluster contains the keywords *education*, *engagement*, *school closure*, and *social presence*. We can conclude from this cluster that there are studies with emphasis on the impacts of the education process, which was experienced after the closure of schools in the pandemic period, on social presence and participation; and the studies also address socialization.

### ***Challenges***

There are 3 keywords in the turquoise cluster: *challenges*, *pedagogy*, and *teachers*. In view of the relationship of these keywords with each other as well as with other clusters, it can be concluded that the challenges faced by teachers and pedagogical problems experienced during the pandemic are examined in this cluster. The fact that the engagement status and challenges experienced in terms of ERT during the pandemic have been frequently examined highlights the need for development of the process in those aspects.

### **Thematic Clustering Analysis of Abstracts**

With the aim to explore the frequently repeated words in the abstracts of the analyzed publications, clustering analysis based on text data was performed in VOSViewer software and a cluster map was generated. Abstract tags and copyright notices (if any) structured in the abstract areas were ignored, and the minimum number of occurrences was determined as 20. 95 out of 5147 terms met the occurrence threshold of 20; 60% of the most relevant terms were clustered and selected in VOSviewer according to the relevance score calculated for each of the 95 terms. Figure 5 shows the 4 clusters formed upon the analysis and covering 57 terms. The size of the bubble indicates the strength of the words in terms of their frequency, association, and influence.)







difficulty, higher education, faculty member. The words *course*, *time*, *class*, and *faculty* have higher frequency, association and influence, which underscores the importance of these elements in the structure and management of distance education. Considering the presence of words emphasizing higher education in this cluster, we think that there have been more studies on higher education. Also, the prevalence of studies on assessments is worthy of note.

### ***Psychology and Stakeholders in Distance Education***

The blue cluster consists of 13 items. In addition to the keywords distance education, ERT, remote teaching, distance learning, instruction, presence of words that reflect the psychological state is remarkable in this cluster. It is understood that most of the studies involved an analysis in this direction by considering the process in terms of anxiety, satisfaction, and perception. Furthermore, learners, instructors, and parents, who are stakeholders of distance education, are included in this cluster, and the word *teacher* (56) is seen to have a higher frequency of occurrence than that of *learner* (34) and *parent* (34). This can lead us to the conclusion that more studies have been done on the *instructor*. Because the words *learner* and *instructor* are located close to other clusters, we can conclude that these concepts are frequently used in other clusters as well.

### ***Learning-Teaching Process***

The yellow cluster consists of 11 items. Words related to the teaching process such as *engagement*, *student engagement*, *participant*, *model*, *use*, *interview*, *online learning*, and *crisis* are concentrated in this cluster. The words *model*, *use*, and *factor* stand out in terms of frequency, association, and influence, which points out to studies that encompass the structuring of the remote teaching process. *Engagement* occurs in three different ways in the same cluster (engagement, participant, student engagement), from which we can understand the significance of engagement in the remote teaching process. We also observe that interviews are commonly used in research.

## **Conclusion and Discussion**

This research aimed to provide a systematic literature review of studies related to the ERT process. Following the search structured in line with the PRISMA framework and performed in the WoS database, 238 publications were analyzed using the bibliometric analysis method. The results of this mapping study reveal the general trends of an intense and rapidly emerging research field. This area of research continues its growth in parallel with the ongoing pandemic.

In the view of the findings of research, the emergence of ERT-related publications for the years 2020 and 2021 and the finding that the term ERT was not used in scientific research conducted before 2020 are seen to be similar to other research findings in the literature (Bond, 2020; Bond et al., 2021; Yavuz et al., 2021). This situation can be associated with the fact that distance education activities carried out in emergency conditions have increasingly become known as “emergency remote teaching- ERT” (Hodges et al., 2020) after the Covid 19 epidemic. Furthermore, the number of publications with a focus on the ERT process, the diversity of sources and citation information not only demonstrate recognition of the idea that the dynamics of ERT and the dynamics of online education should be positioned differently, but also point to the fact that there have been efforts in place to build scientific studies based on this idea. The increase in the number of these studies in the year 2021 can be considered as a natural

consequence of the process of conducting and publishing research on teaching activities during the Covid-19 pandemic that emerged in 2019.

An analysis of the studies on ERT by publication type reveals that most of the studies are composed of journal articles, followed by review papers, editorials, and conference proceedings. This finding supports the study by Darsono (2020) which demonstrated that publications consisted of articles and review papers, respectively, in this field. There are also other studies indicating that most of the publications in the field consist of articles, and supporting the research findings (Al-Zaman, 2000; Bond 2020; Köseoğlu & Bozkurt, 2018; Mishra et al., 2021).

When the distribution of publications is analyzed by subject, most of the publications are in the field of educational sciences, which are followed by environmental sciences, and medicine and health sciences. This finding is consistent with other studies indicating that most of the publications on distance education and e-learning have been made in the field of educational sciences (Amoozegar et al., 2018; Hung, 2012). Bond et al. (2021) stated that the highest number of publications on ERT were made in the fields of health sciences and natural sciences, mathematics and statistics, and education. Although the ranking of the studies varies in the research, the top three fields have remained the same. In that regard, the findings obtained from the studies support each other. Considering that ERT studies were mostly carried out during the Covid-19 pandemic, it is predictable that research has been conducted on the natural sciences and health sciences, with which the pandemic is closely associated. The high number of studies in the field of education is that the reviews focused on research in the field of ERT.

The countries that have significantly contributed to studies on ERT are the United States, Spain, the UK, People's Republic of China, and South Africa, respectively. Similarly, there are studies in the literature demonstrating that Spain, the US, the UK, and China are among the top ten countries that produce many publications in this field (Ahmad et al., 2018; Al-Zaman, 2020; Bond et al., 2021; Darsono, et al., 2020; Gupta & Dhawan, 2020; Wang et al., 2017; Yavuz, et al., 2021). Despite the difference in ranking, this result substantially matches the research findings. Similarly, other bibliometric studies listing the US and the UK as the most productive countries in the literature (Ahmad et al., 2018; Fatima & Abu, 2019; Mishra et al., 2021; Sezgin, 2021), support this finding. The difference between countries and rankings of the studies can be explained by the difference in size and structure of the study data, in the databases used, and in the limitations of the studies. The large number of studies conducted in China may be attributed the fact that the virus emerged in China and there was the intention to convey the news about the situation and conditions in China to the entire world (Chahrour et al., 2020; Yavuz, et al., 2021;). It is noteworthy that many studies referred to the US and the UK as the most productive countries in terms of ERT. This situation can be interpreted as a conscious effort by developed or developing countries leading in the human development index ranking (United Nations Development Programme, 2020) according to the per capita income to manage the education processes correctly and to ensure sustainability of the education processes in the time of crisis by revealing research conducted on ERT and current trends in this subject (Sezgin, 2021). Nonetheless, when assessing the contributions of countries to studies on ERT, it is recommended that the changing national responses to COVID-19 and the measures implemented to fight against the spread of the pandemic should be considered, and that the situation should be evaluated within the specific context of the pandemic (Bond et al., 2021). The unavailability of research in the countries that are not included in the ranking may be due to research indexed in other databases that were not analyzed, and research published in the local language of the country other than English language. Another factor affecting the ranking may be that international databases mostly index journals that only accept submissions in English (Tight, 2019).

Upon a review of the list of journals with the highest number of papers in the field and the highest citation count, it has been revealed that the list of the most productive journals mostly concentrates on the field of educational sciences; and there are also journals in the fields of environmental sciences, medicine, and health sciences. *The International Journal of Educational Technology in Higher Education*, which was listed among the most productive journals in the research with the highest Journal Impact Factor (JIF), is also found to be the most productive journal on open education practices as reported in the study by Köseoğlu and Bozkurt (2018). According to the findings of the research, the journal ranked 9th in the list of most productive journals. It has been found out that *Online Learning, Education Sciences* and *Sustainability* journals were listed among the top ten journals both with the highest productivity and the highest citations. Zhang et al. (2022) also listed the journals *Sustainability* and *Education and Information Technologies* as among the most productive journals in their study where they used the bibliometric method to analyze online learning experiences during the pandemic. According to various studies that followed the e-learning trends during the pandemic, *Education Sciences* and *Sustainability* journals were seen to be leading in the ranking in terms of publication output and citation rate (Yavuz, et al., 2021). An examination of the journals by discipline noted that educational sciences and environmental sciences were again the most common fields studied on this subject. It can be suggested that the uneven distribution of the 5 Year Impact Factor (JIF 5 Year), Journal Citation Indicator (JCI), and JCI Quartile (JCI Q), which is used to measure the scientific impact of the journals in the list of journals with the highest productivity and highest citation count, may be due to the publication speed during the pandemic and the difference in the publication process in some journals (considering the effect of the peer review process affected by the pandemic).

The data obtained within the scope of authorship patterns and collaboration under this research demonstrated that most of the studies in this field were conducted by more than one author. Multi-authoring outweighs in this subject area, and collaborative research is common. As indicated by Fatima and Abu (2019), the number of articles with two or more authors displayed a steady increase in all block years between 1989 and 2017. This finding supports the result obtained from the research. There are also different studies that confirm the conclusion that most of the studies are reported in multi-authored papers (Al-Zaman, 2020; Dehghanbanadaki et al., 2020; Kaya & Erbay, 2020). Degree of collaboration for this study was found to be 0,84. The degree of collaboration between the authors between years 2013 and 2017 was found to be 0.93 according to the bibliometric study on e-learning by Fatima and Abu (2019), and 0.81 according to Mishra et al. (2021). This research finding is in harmony with the results of other bibliometric studies in which multi-authoring predominates, and collaboration is adopted to a remarkable extent.

The thematic clustering analysis for keywords demonstrates that the most important topics that are addressed in the studies on ERT are the process of pandemic, distance education and higher education. The thematic clustering analysis for the abstracts also reveals that higher education is at the forefront. Considering that the term *higher education* is among the keywords with the highest influence, we can conclude that distance education activities concentrating on the higher education level predominate. Similar to the findings of this research, Sezgin (2021) noted in his study analyzing the publications on the ERT process that such publications were mostly in the field of higher education. There are also other studies supporting this finding (Bond et al., 2021; Mishra et al., 2021; Bozkurt & Zawacki-Richter, 2021), and noting that there are limited studies on the K-12 level (Bond, 2020; Cachón-Zagalaz et al., 2020). Nevertheless, it is reported that the pandemic has had important effects on K-12 education and that there is need for

further study in this field (UNESCO, 2020). According to the research findings, the term *secondary education* is one of the terms that is repeated in fewer number of studies and is less relevant. Therefore, it is anticipated that more research on the K-12 level will enrich the ERT literature.

The challenges experienced regarding teachers and pedagogic issues during the process, teacher education, student-related characteristics (such as self-regulated learning-motivation-academic success) and participation are located at the center of the map, which suggests that the topics are meso-level factors that are frequently repeated and are associated with other concepts. It is seen that the factors related to teachers, participation and structuring of distance education come to the fore in the thematic cluster analysis for the abstracts. Other studies support the finding of the structuring process of distance education and the high prevalence of the studies on teachers in this research (Rosenberg, 2012; Welsh et al., 2003; Sampson & Zervas, 2013). In a similar manner, there is emphasis on the importance of an integration between information and content management, learning management systems and teaching staff training for the future of e-learning. The findings of our study are also in harmony with the findings of Zawacki-Richter et al. (2009) in terms of the emphasis on participation and student characteristics. In their study aimed to determine the general trend of research on distance education between 2000-2008, Zawacki-Richter et al. (2009) similarly stated that the interaction in learning communities, learner characteristics and instructional design (Zawacki-Richter, 2009) are among the most studied subjects although they are considered important at the micro level. Similar to this research, studies that emphasize the need for teacher education in online learning (Zawacki-Richter, 2009; Bozkurt & Zawacki-Richter, 2021; Johnson et al., 2020; Sepulveda-Escobar & Morrison, 2020; Jelińska & Paradowski, 2021), mention the importance of e-learning for professional development (Cheng et al., 2014), and underline the significance of social interaction (Bozkurt & Zawacki-Richter, 2021). The challenges experienced in relation to the process, as reported in findings of this research, are also seen to be prominent in numerous ERT practices. A large number of studies available lay stress on the challenges faced due to the very first experience of distance education during the pandemic (Chatziralli et al., 2020; MacIntyre et al., 2020), and point to various mental problems such as stress, decrease in motivation, anxiety, feeling of isolation caused by additional planning and preparation stages (MacIntyre et al., 2020; Petillion & McNeil, 2020; Kapasia et al., 2020; Green et al., 2020), indicate technical challenges as to internet and computer access (Aboagye et al., 2020; Gillis & Krull, 2020; Jandric et al., 2020), and emphasize digital privacy and the digital divide throughout the process (Khlaif et al., 2021). Considering the dynamics of the emergence of ERT process and the speed of the pandemic in shaping the education process, it is comprehensible that the professional development of teachers who must adapt to the process, the characteristics of students who do not yet have a distance education culture, and the challenges experienced in the process are frequently addressed.

Regarding the frequency of repetition and association of keywords, the importance of concepts such as instructional design, collaborative learning, social presence, and assessment remained at a more micro level. Such concepts reappear in ERT studies, maintaining their importance as before the pandemic. Similar to the findings of this research, studies that mention the role of assessment tools in the ERT process (Bond et al., 2021), emphasize that instructional design is among the most frequently studied subjects in distance education research (Zawacki-Richter et al., 2009), and underscore the importance of social presence and collaborative learning by noting that the Community of Inquiry framework can be used to reassess, organize and manage ERT (Chiroma et al., 2021).

With the compulsory and widespread transition to online education during the pandemic, many stakeholders of education have experienced online learning through ERT, and such experiences and the process have been analyzed and interpreted by many studies. Trend analysis of ERT research provides us with many different findings in this process, in addition to the prominent topics related to online education in the period before the pandemic. Researchers that acknowledge the difference between ERT and online education and build their analysis upon that difference usually concentrate on the article format in the field of educational sciences. They focus on themes such as the pandemic, and higher education studies in this process, professional development, pedagogical issues, student characteristics and social interaction. It is anticipated that the implications for policy and practice based on the examination of research trends will have a significant effect on the structuring of future online learning environments, as well as the ERT designed for emergencies.

### **Limitations and Future Avenues of Research**

As with all other studies, this study also has certain limitations. The first limitation is associated with the method employed. Although bibliometric analysis is a suitable method to analyze research productivity, monitor the growth and development direction of research and make sense of large data sets (Bornmann, 2014), there are studies that consider the method to be insufficient in revealing the social impacts, and point out to limitations of those analyses as they are largely based on the metadata of publications rather than their actual content (Mishra et al., 2021). To overcome this limitation at least partially under this study, Co-word Analysis of Keywords and Text Analysis of Abstracts were used, focusing on the analysis of the actual content of the studies. However, as there are usually many documents examined in bibliometric studies, no detailed information is provided on the results of the relevant studies.

Information is not provided in detail; furthermore, bibliometric studies usually take a long time to monitor the growth and development direction of the research. However, the unprecedented volume of publications produced on online education during the pandemic (González-Zamar et al., 2020), justifies the use of bibliometric method, which is referred to as a suitable method to make sense of large datasets and analyze efficiency (Bornmann, 2014). There are also studies that analyze online learning studies within the period limited to the pandemic using the bibliometric method (González-Zamar et al., 2020; Rodrigues et al., 2020; Yaacob & Gan, 2021; Zhang et al., 2022).

Another limitation is related to the sole use of the WOS database. The WOS database has the highest international recognition and contains thousands of academic publications and bibliographic data about authors, links, and citations with high scientific recognition in the academic world (Rodrigues et al., 2020). Yet, future research can be structured in such a way to include other databases as well. For example, ERT studies can also be scanned in the Scopus database, which can help reveal studies that were not indexed in WOS and whose content may be important and include them in classifications.

Another limitation is that due to the ongoing pandemic, there have been more and more studies on ERT, and not all these studies are searched in the WoS database. Moreover, many journals have been announcing special issues on the global impact of COVID-19, and institutional reviews are underway. Regarding the ongoing situation of the pandemic and hence the use of the term *ERT*, the search needs to be constantly updated to cover different databases. The inclusion of the results of this research, which aims to systematically identify, categorize,

and analyze ERT studies in other future analysis studies is of importance in terms of showing the development direction of the expanding ERT literature analysis.

This article covers only open access studies in English language. Gray literature was not included in the scope, either. Both exclusions limited the findings of the research. Only open access publications are included within the scope since the studies in this field are overwhelmingly composed of open access content (Bond et al., 2021), with the increase in the number of open access journals being described as “an efficient way to co-construct knowledge” (Beigel, 2014, p. 619). ), and open access publication enables a more even distribution of publications to regions across the globe (Bond et al., 2021). Nevertheless, other mapping studies, including those that are not open access and are published in other languages, are expected to enrich the field.

Finally, this study provides fertile ground for many future studies. Current trends indicate that online teaching methods will be more integrated into conventional teaching processes in the post-pandemic period (Dost et al., 2020). Nevertheless, there is a need for more research on how digital transformation is supposed to improve teaching environments (García-Peñalvo, 2021). Within this context, it is recommended that the research trends in blended learning processes, other e-learning and technology-supported learning processes should be analyzed in other databases and with different methods in a similar fashion to the ERT process, and the number of studies on different levels such as k12 should be increased. In the view of effect of the pandemic on the rapid transition to online education and the general trend of ERT studies, it is anticipated that research on the design of online courses, professional development of teachers, online learning communities, the institutional structure and management of online education, the relationship of online education with psychological factors, and the positioning of post-epidemic online education activities at all educational levels will contribute to the field in the future.

### **Declarations**

The authors declare no conflicts of interest.

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