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Examining the trends of research on educators' readiness in online teaching & learning (2013-2022): a bibliometric analysis

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ABSTRACT

Despite recent emphasis, the usage of online and blended learning as instructional methodologies in higher education is still unequal, leading to variations in students' learning experiences across structures, areas, and programs. Research on the aspects concerning educators' adoption and adaptation of online teaching is crucial to overcome this limitation. By using the terms 'Educators AND Online Learning AND Readiness', 391 journal articles were listed for further analysis. Microsoft Excel was used for frequency analysis, VOSviewer to visualize data, Harzing's Publish or Perish to compute and evaluate citation metrics, and Words Cloud to create a cluster of words that were shown in various sizes. The bibliometric criteria used in this study to summarize results includes language, topic area, research trends by year of publication, top contributors by nation, most significant institution, and name of the active source and others. This research includes a citation analysis, an authorship analysis, and keyword analysis. The results show that from 2013 to 2022, the rate of publication increased, and a spike was seen from 2019 to 2020 due to the COVID-19 epidemic. Identification of the important blended learning outcome predictors will help with the initial planning of this creative pedagogical strategy.

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1. INTRODUCTION

During early 2020, the COVID-19 pandemic forced educational institutions globally to abruptly shift to online teaching and learning, regardless of their readiness [1]. This marked a significant shift in the way knowledge was transmitted, requiring educators to completely redesign their courses. It involved extensive use of technology and a thorough re-evaluation of instructional and learning strategies [2].

Nevertheless, the transition to online teaching and learning was unexpected and disorganized for both educators and students. The lack of guidelines and the absence of established practices hindered a smooth transition [3]. Moreover, many instructors lack the necessary skills for online pedagogies, as these are not typically covered in their training programs [4]. Gaining insights from teachers' experiences during the pandemic's rapid shift to online education is crucial for preparing universities and schools for upcoming online and blended learning [5].

Since online learning has been gaining popularity over the past 10 years, especially since COVID-19 epidemic, there is a stronger requirement for teachers who can effectively conduct online lessons. Despite increased demand, a detailed analysis of research trends and patterns regarding educators' preparation for

online teaching and learning is still lacking. This study fills this void by doing a bibliometric analysis on this issue between 2013 and 2022 to identify the most important research subjects, major authors, contributing nations, and emerging trends.

Readiness for online teaching can be defined as the class's preparation level for online instruction [6]. Educators' willingness for online teaching and the institution's readiness are interrelated, influenced by many factors [7]. Individual readiness is shaped by self-efficacy, past experiences, and future-oriented projections of knowledge and skills [8]. The institutional preparedness for online education is influenced by the environment, including available resources and professional development [9]. This article aims to provide an overview of the current research on educators' preparation for online education. It will address the following research questions (RQ):

RQ1: How have papers about educators' readiness in online teaching and learning research developed and been distributed online over the past decade?

RQ2: Who are the main participants in the study on educators' readiness for online teaching and learning? How have they cooperated over the last 10 years?

RQ3: What significant issues have been addressed in studies on educators' readiness for online teaching and learning during the last 10 years?

This study is based on bibliometric analysis to assess the readiness of educators for online teaching and learning. The analysis and results section presents the evaluation of data collected from Scopus database. The subsequent findings provide an overview of the study, discusses its limitations, and offers recommendations for further research.

Bibliometric analysis utilizes quantitative evaluations such as statistical and mathematical methods to assess scientific research papers, books or other media types. The publication of research results in peer-reviewed international journals serves as the foundation for bibliometric analysis, enabling people to study and reference them [10]. This analysis helps determine the volume and quality of published papers, allowing for the identification of patterns and trends within a specific field of study.

Bibliometric indicators can be categorized into three groups: structural, quantity, and quality indicators. Structural indicators reveal relationships between publications, authors, and subject fields, while quantity indicators assess a researcher's productivity. Quality indicators evaluate the effectiveness of a researcher's work and include measures such as total citation counts, citation counts per year, h-index, g-index, CiteScore, and others. Structural indicators of published content can be analyzed through bibliographic coupling, co-citations, and co-authorship using tools like VOSviewer [11].

One recent study [12] on educators' readiness for online education analyzed 1,543 research articles from Scopus database to identify top academic journals, authors, countries, and subjects in web-based learning readiness. Another study [7] which focused on the number of research articles per year, reveals a substantial increase in works on digital readiness due to the impact of the COVID-19 pandemic. This study also examined the geographic distribution, most-published journals, and most-co-cited publications in the field. The scope and level of research included in this review may vary based on the study duration (January 2020 - August 2021). Table 1 shows a curated list of articles on educators' readiness for online education with a comprehensive bibliometric analysis.

Table 1. Previous articles on educators' readiness in online teaching and learning related studies and bibliometric analysis

Study	Domain/search strategy	Data source and scope	TDE	Bibliometric attributes examined
[12]	Online learning readiness	Scopus database 2011-2022	1371	- 10 years of published works in e-learning preparation. - Top 15 prolific authors for ready research on e-learning. - Top 15 country on e-learning ready research. - 5th most prolific journals in the past 10 years on online ready - In the last 10 years, primary research keywords related to e-learning preparedness have been published in the most cited journals.
[7]	Digital readiness	Scopus database 2019-2020	689	- Annual number of studies - Research-based publications by country - Keywords in the cluster
[13]	Online learning, higher education, and COVID-19	Web of Science (WoS) Jan 2020 – August 2021	1394	- Regional distribution of publications - The top 10 journals with the most publications - Top 20 documents in the database with the most co-citations - Themes that have emerged from the literature review.

TDE=Total documents examined

2. METHOD

The methodology of this study is bibliometric analysis using data from Scopus database. The study intended to perform systematic reviews of research by modifying the preferred reporting items for systematic reviews and meta-analyses (PRISMA) criteria. A query was done on March 20, 2022 in Scopus database, searching for terms related to online education, as well as keywords related to educator's readiness and preparation. The focus was primarily on article titles, since it provided insight into scope of study. Subject filters were then applied to refine the search results, considering factors such as timeframe, source type, and material type to filter irrelevant articles. Finally, 391 articles were identified and selected for further analysis Figure 1. The data were exported in CSV and RIS formats and analyzed using Microsoft Excel, VOSviewer, and Harzing's Publish and Perish tools to determine citation metrics and other relevant rates.

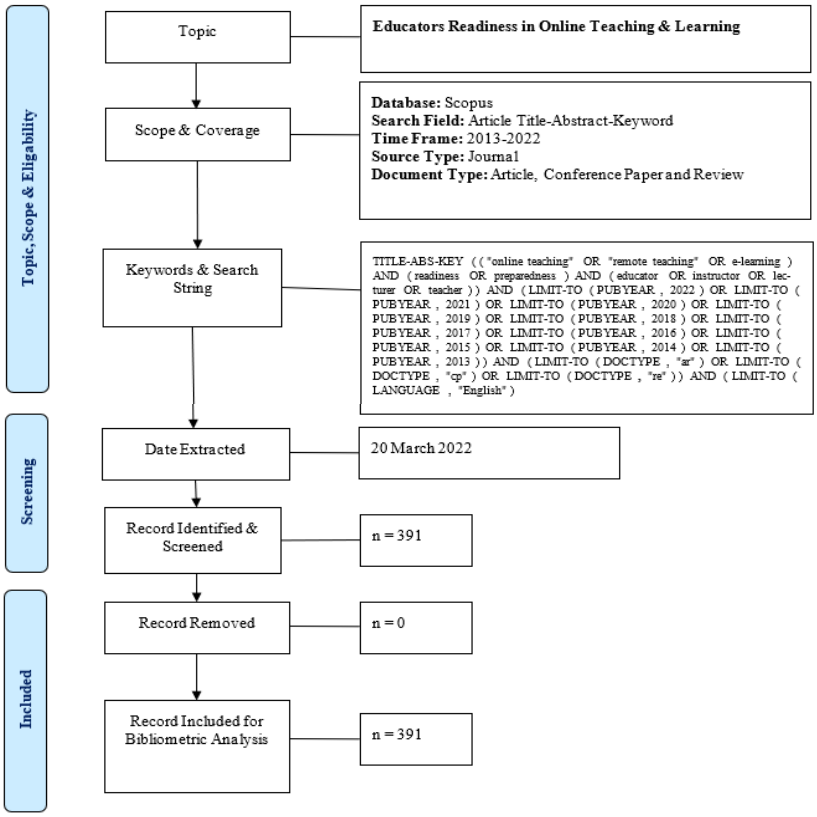


Figure 1. Flow diagram of the search strategy

3. RESULTS AND DISCUSSION

3.1. Research question 1

The first research objective is to ascertain how papers on educator's readiness in online teaching and learning have changed and been shared over the past 10 years by examining publications by languages and productivity in research.

3.1.1. Publications by languages

According to Table 2, majority (99.49%) of the 391 articles were written in English, followed by French and Spanish. However, just 0.25% of the population speaks French and Spanish respectfully. English is an official recognized lingua franca in the scientific field which explains why most scientific publications are in English [14].

3.1.2. Productivity in research

In the second part of this study, the quantity of annual publications was used as an indicator to track the trend and pervasiveness of the research topic over time [15]. Tables 3 and 4 shows an increasing trend in the number of publications on educators' readiness for online education since 2013, while 2021 have the highest count, the number is expected to keep increasing also citations for educators' readiness in online teaching and

learning research by year. A total of 73 articles discussed educators' readiness for online teaching and learning, similarly, year 2021 receiving the most mentions. The graph in Figure 2 reflects a lower number of articles and citations on this topic between 2016 and 2019, but a significant spike from 2019 to 2020, likely due to the quick shift to online learning triggered by the COVID-19 outbreak [16].

Table 2. Types of languages

Language	Total publications (TP)*	Percentage (%)
English	391	99.49%
French	1	0.25%
Spanish	1	0.25%
Total	393	100.00

Table 3. Number of publications for educators' readiness in online teaching and learning research by year

Year	TP	Percentage (%)	Cumulative percentage	Year	TP	Percentage (%)	Cumulative percentage
2013	18	4.60	4.60	2018	25	6.39	27.88
2014	12	3.07	7.67	2019	35	8.95	36.83
2015	16	4.09	11.76	2020	68	17.39	54.22
2016	20	5.12	16.88	2021	157	40.15	94.37
2017	18	4.60	21.48	2022	22	5.63	100.00
Total	391						

Table 4. Number of citations for educators' readiness in online teaching and learning research by year

Year	TP	NCP	TC	C/P	C/CP	*h*	*g*
2013	18	14	96	5.33	6.86	3	9
2014	12	11	108	9.00	9.82	5	10
2015	16	15	175	10.94	11.67	6	13
2016	20	17	202	10.10	11.88	7	14
2017	18	15	163	9.06	10.87	7	12
2018	25	16	143	5.72	8.94	6	11
2019	35	26	128	3.66	4.92	6	10
2020	68	48	468	6.88	9.75	11	20
2021	157	73	319	2.03	4.37	8	14
2022	22	7	9	0.41	1.29	2	2
Total	391						

Notes: TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

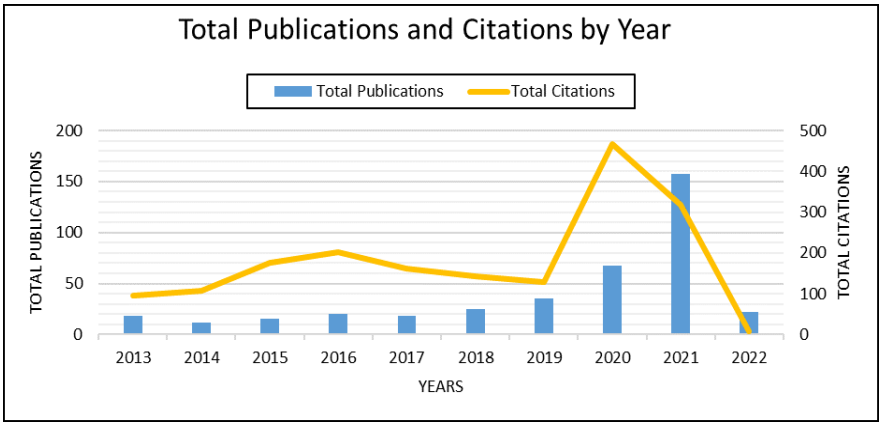


Figure 2. Total publications and citations by year

3.2. Research question 2

By assessing the results of the study, the features of scientific partnerships on educators' preparation in online teaching and learning research were identified i) the top nations contributing to publications; ii) the most influential affiliations; iii) the most active journal; iv) citations analysis; and v) the most productive authors analysis [17].

3.2.1. Top countries contribute to the publications

Table 5 shows the countries that actively influencing educators' preparation for online education from 2013 to 2022. Indonesia leads with the highest number of publications at 14.32% [13], surpassing Malaysia [13] and United States [10]. In addition, Russia [18] and India [17] contributed with fewer than 40 publications combined. Figure 3 illustrates the geographic distribution of publications across these top countries, highlighting the importance of educators' preparation for online education in different geographic contexts.

Figure 3 displays a map of citations categorized by nations, with seven main clusters. The size of each country's node represents the number of articles linked to it. In Figure 4, cluster 1 consists of Brunei, Indonesia, Malaysia, and Iran; cluster 2: United States, Australia, India, Spain, Russia, and United Kingdom; cluster 3: Saudi Arabia, Bahrain, and Russia; cluster 4: Hong Kong, Thailand, Philippines, India, and Oman; cluster 5: South Africa and Nigeria. The sixth cluster includes Australia, China, and Norway. Lastly, the seventh cluster comprises of Canada, Spain, Latvia (Europe), and Finland.

Table 5. Top five countries that contributed to the publications

Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
Indonesia	56	26	66	1.18	2.54	4	5
Malaysia	49	35	142	2.90	4.06	6	10
United States	42	26	245	5.83	9.42	8	15
Russian Federation	33	24	245	7.42	10.21	7	15
India	23	10	110	4.78	11.00	5	10

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

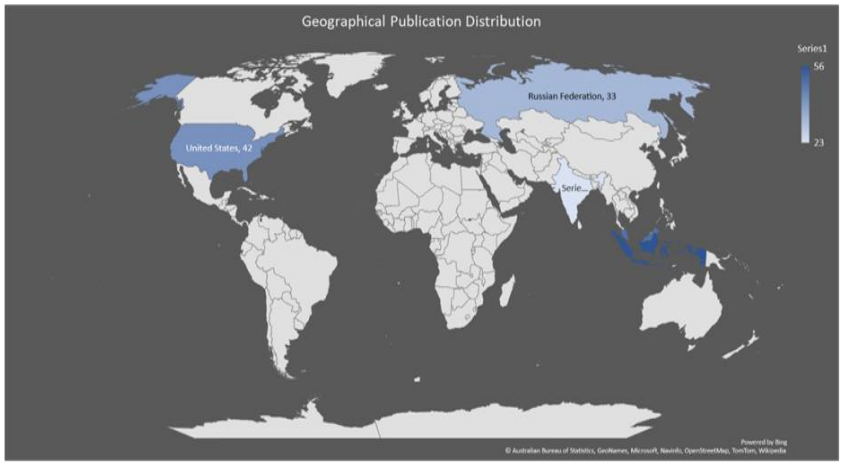
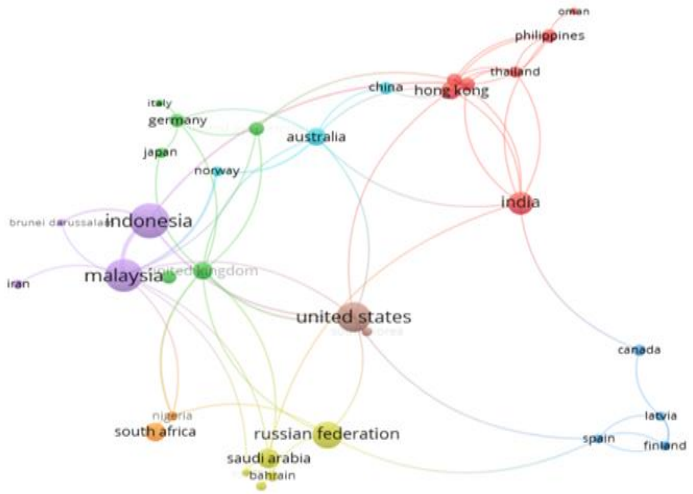


Figure 3. Countries contributed to the articles on educators' readiness in online teaching and learning



Notes:
Minimum number of documents of an author=3;
Minimum number of citations of an author =3

Figure 4. Network visualization map of the citation by countries

3.2.2. The most influential institution in this research

Table 6 shows a list of prominent organizations with at least six publications on educators' preparation in online education. From the 391 articles, three universities - Universiti Teknologi Malaysia, Bina Nusantara University, and Universitas Pendidikan Indonesia - each contributed 8 publications, making them the top contributors. Universiti Kebangsaan Malaysia and Universiti Malaya ranked fourth and fifth with 7 and 6 publications, respectively. Other institutions outside the top 5 list contributed 6 or fewer publications.

Table 6. Top five of most influential institutions with a minimum of six publications in articles of educators' readiness in online teaching and learning

Affiliation	Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
Universiti Teknologi Malaysia	Malaysia	8	7	30	3.75	4.29	3	5
Bina Nusantara University	Indonesia	8	4	14	1.75	3.50	2	3
Universitas Pendidikan Indonesia	Indonesia	8	3	4	0.50	1.33	1	1
Universiti Kebangsaan Malaysia	Malaysia	7	7	20	2.86	2.86	2	4
Universiti Malaya	Malaysia	6	3	45	7.50	15.00	2	3

Notes: TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

3.2.3. The most active journals

According to the survey, IOP Publishing Ltd is the most active publisher, with 18 publications of the Journal of Physics Conference Series as shown in Table 7. This is followed by The Journal of Education and Information Technology, with 79 citations at second place. It currently leads in CiteScore (CS), a scientometric indicator developed by Scopus to measure the success of journals in citation analysis with a score of 5.4. CS provides a more accurate representation of citations compared to the Impact Factor. Elsevier's database offers various measures for assessing research quality, including Scimago Journal Rank (SJR) and Source Normalized Impact per Paper (SNIP) [15].

Table 7. Most active journals

Source title	TP	TC	Publisher	Cite score	SJR 2019	SNIP 2019
Journal Of Physics Conference Series	18	18	IOP Publishing Ltd	0.7	0.21	0.464
Education and Information Technologies	9	79	Springer Nature	5.4	0.919	1.964
International Journal of Learning Teaching and Educational Research	7	7	Society for Research and Knowledge Management	0.6	0.197	0.309
Education Sciences	6	140	Multidisciplinary Digital Publishing Institute (MDPI)	2.1	0.453	1.204
Interactive Technology and Smart Education	6	10	Emerald	3	0.507	1.028

Notes: TP = total number of publications; TC = total citations

3.2.4. The citation analysis

Citation analysis is used to evaluate the value and significance of research articles [14]. Table 8 presents the citation metrics for the selected texts as of March 20, 2022. The articles on educator's readiness in online teaching and learning have accumulated over 1,811 citations within 10 years (2013–2022). The citation measure was generated using Harzing's Publish or Perish program, which extracted raw citation metrics in RIS format from the Scopus database.

Table 8. Citations metrics

Metrics	Data	Metrics	Data
Publication years	2013-2022	Cites_Paper	4.63
Citation years	10	Cites_Author	813.75
Papers	391	Papers_Author	163.49
Citations	1811	Authors_Paper	3.31
Years	9	H -index	22
Cites_Year	201.22	g-index	33

3.2.5. The authorship analysis

Table 9 presents the top 10 papers on educators' preparation for online education. The most cited article was "A complete examination of e-learning management perspectives," published by MDPI and received 78 citations [19]. The paper identifies the key success aspects for e-learning during the COVID-19 epidemic. Additionally, the most prolific author with the highest number of citations are also listed.

Table 9. Top 10 highly cited articles on educators' readiness in online teaching and learning

No.	Study	Title	Year	Cites	Cites/year
1	[19]	E-learning critical success factors during the covid-19 pandemic: A comprehensive analysis of e-learning managerial perspectives	2020	78	39
2	[20]	A snapshot of online learners: e-Readiness, e-Satisfaction and expectations	2015	70	10
3	[21]	Teacher readiness for online learning: Scale development and teacher perceptions	2016	65	10.83
4	[9]	Teacher Educators' Readiness, Preparation, and Perceptions of Preparing Preservice Teachers in a Fully Online Environment: An Exploratory Study	2013	62	6.89
5	[1]	Faculty readiness for online crisis teaching transitioning to online teaching during the COVID-19 pandemic	2020	55	27.5
6	[2]	Profiling teachers' readiness for online teaching and learning in higher education: Who's ready?	2021	53	53
7	[8]	An assessment of online instructor e-learning readiness before, during, and after course delivery	2016	50	8.33
8	[22]	The roles of academic engagement and digital readiness in students' achievements in university e-learning environments	2019	47	15.67
9	[23]	Readiness for integrating mobile learning in the classroom: Challenges, preferences and possibilities	2017	44	8.8
10	[24]	Challenges and opportunities for Russian higher education amid covid-19: Teacher's perspective	2020	42	21

3.2.6. The authorship analysis

Table 10 presents the list of prolific writers who made significant contributions with at least three publications. Notable researchers include R. Christensen, G. Knezek, D. Adams, I.F. Adi Badiozaman, and M.S. Nordin, each with multiple related publications. R. Christensen and G. Knezek from the University of North Texas stood out with four articles, while Adams, Adi Badiozaman, Nordin, and others have three publications. These authors come from various geographical regions. It is worth noting that Christensen and Knezek have the highest average citations per publication (16 times) among other authors, with a h-index of 3 and 4 total publications. Hirsch's concept of the h-index is significant in analyzing both the quantity and quality of a researcher's work [25].

Table 10. Most productive authors with a minimum of three publications

Study	Affiliation	Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
[23]	University of North Texas	United States	4	3	64	16	21.33	3	3
[26]	University of North Texas	United States	4	3	64	16	21.33	3	3
[15]	Universiti Malaya, Kuala Lumpur	Malaysia	3	2	34	11.33	17.00	2	2
[27]	Swinburne University of Technology Sarawak	Malaysia	3	2	3	1.00	1.50	1	1
[11]	International Islamic University Malaysia	Malaysia	3	3	5	1.67	1.67	2	2

Notes: TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

Co-authorship maps are utilized to visualize the networks within scientific collaborations when multiple authors work together on a manuscript [28]. Figure 5 illustrates three distinct clusters denoted by different colors, with variations in text size, circle size, and line thickness. The connecting lines shows strong connections between the authors, indicating collaboration [29]. Notably, Nordin, M.S. has the largest node among all visible co-authors and demonstrates the highest level of collaboration and average citations per publication.

3.3. Research question 3

To address RQ3, the citation networks of the 391 articles were analyzed using keyword co-occurrence analysis as seen in Table 11. This technique determines the association between words in the literature. The most frequently used keyword in educators' preparation for online teaching and learning research was "e-learning" (64.19%) followed by the term "students" (28.13%). Other commonly used keywords included "teaching," "online learning," "COVID-19," and "education." The keywords were analyzed using VOSviewer, which identified connections between concepts through keyword co-occurrence [26]. Figure 6 illustrates a network of author's keywords with at least five instances, indicating their overall strength of connections [30].

Electronic evaluation, blended learning, higher education institutions, digital technology, and online preparation are all part of the blue cluster. The red cluster includes the phrases education, pandemic, COVID19, incentive, remote teaching, teacher, and education distance. The yellow cluster is linked to educational technology adoption and action, mobile devices, mobile learning, and teaching. The largest node, "e-learning," was located closest to the "teaching" node; this implies that the two terms have a close relationship [30].

Table 11. Top 20 Keywords

Author keywords	Total publications	Percentage (%)	Author keywords	Total publications	Percentage (%)
E-learning	251	64.19%	Computer aided instruction	33	8.44%
Students	110	28.13%	Personnel training	33	8.44%
Teaching	90	23.02%	Human	32	8.18%
Online learning	57	14.58%	Education computing	29	7.42%
COVID-19	56	14.32%	Curricula	27	6.91%
Education	51	13.04%	Teaching and learning	27	6.91%
Engineering education	48	12.28%	Online teaching	26	6.65%
Surveys	48	12.28%	Blended learning	25	6.39%
Learning systems	39	9.97%	Pandemic	24	6.14%
Higher education	38	9.72%	Readiness	20	5.12%

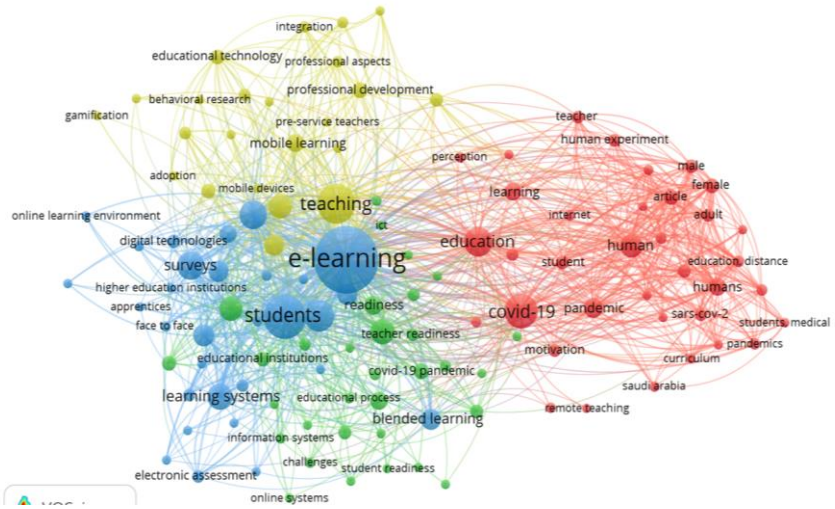


Figure 5. Network visualization map of author keywords with at least 5 occurrences

Figure 6. Word cloud of the author keywords

4. CONCLUSION

This research presents a comprehensive bibliometric analysis of the literature on educators' readiness for online teaching and learning from 2013 to 2022. The analysis examined 391 documents from the Scopus database, revealing that 157 publications (40.15%) focused on this topic, with an increasing trend each year. IOP Publishing Ltd emerged as the leading publisher with 18 publications and 18 citations, while the Multidisciplinary Digital Publishing Institute (MDPI) was the top cited publisher, accumulating 140 citations in related studies. English was the most frequently used language, and the quantity and popularity of journal articles on this topic have consistently grown over time. Malaysia and Indonesia were identified as leading

countries in publications, with Universiti Teknologi Malaysia being the most frequently associated organization. The study highlighted "Educator's Preparation in Online Teaching and Learning Research" as the most referenced source and used VOSviewer and Harzing's Publish or Perish programs to visualize scientific partnerships and citation metrics, revealing 1,811 citations across the 391 papers. Alqahtani and Rajkhan were noted as the most prolific writers, while Christensen and Knezek from the University of North Texas were the most productive authors.

The study also focused on key subject areas in educators' preparation for online teaching and learning, with "e-learning" being the most frequently used keyword at 64.19%. The research, based solely on Scopus data, suggests future studies should include other databases like Web of Science and Google Scholar for broader data variation. The study advises using additional analysis methods, such as fractional counting and bibliographic coupling, to triangulate results and mitigate biases from self-citations. Overall, this study offers novel insights into trends in educators' preparedness for online teaching and learning, examining research productivity, influential institutions, and key topics. It highlights research gaps and opportunities for future investigation, providing valuable insights for researchers, policymakers, and educators to understand the research landscape and identify areas for further research and improvement, such as performing bibliometric analysis on the effectiveness of online education.

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