# Bibliometric Analysis: Digital Learning at 2017-2023

Reza Kastara, Anugrah Arya Bakti, Heri Retnawati, and Jumriani Sultan

Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
rezakastara.2022@student.uny.ac.id

**Abstract.** Digital learning has become an interesting topic of conversation in recent years. This is motivated by the rapid development of technology and information at this time. The aim of this research is to map articles published on Scopus including identifying research trends, article production per year, relevant sources, and contry production. This research uses bibliometric analysis using "biblioshiny" in the R-Studio package. The findings from the analysis show an increase in the number of articles in 2020 and the journal Education and Information Technologies is the journal with the most articles published on digital learning. Then, the article with the most citations was written by Pokhrel S with 851 citations, while the University of Helsinki has the largest number of article publications related to digital learning topics. The country with the highest productivity in publications is. United States, Germany, Australia, Indonesia and China. The overall findings of this research indicate the need for further study regarding digital learning as an investment in the future, especially in the field of education.

**Keywords:** Bibliometrics, Digital learning, Learning.

## 1 Introduction

In the 21st century, technology plays an important role in our daily lives, calling professionals, educators and learners to reflect on their fundamental beliefs [1]. In recent years, various digital technologies have developed [2]. In an era when knowledge and information flow rapidly, the application of digital learning covers a wide range of fields and industries [3].

The Covid-19 pandemic has made digital technology a living network not only for education, but also for work, information and entertainment. Digital technologies such as smartphones, social media, the internet, software applications, and e-books have redefined the educational landscape, allowing academic institutions to deliver instruction virtually during lockdowns [4]. Our overwhelming reliance on the digital world during this crisis has created an impetus to harness its power for better learning opportunities.

Digitalization has the potential to meet broader learning needs, improve and disseminate effective practices, increase efficiency, and better integrate learning and assessment [5], [6], [7], [8]. At the same time, education stakeholders are beginning to understand that we must counter some of the disruptive effects of digitalization in and for education: this starts with digital reading skills [9].

Learning without technology seems impossible in this modern era [10]. Then use of digital learning in teaching is very necessary and is in line with technological advances and the major developments that surround us in all aspects of life [11]. Developments in the digital revolution have made teachers, and prospective teachers, have to be able to adapt to provide digital learning resources to students [12]. Digital or distance learning enables individualized and adaptive learning pathways [13].

Digital technologies that can be utilized by schools/teachers to improve the quality of the learning process include interactive whiteboards (IWB), software applications, Web 2.0, and social media. These technologies have the potential to enhance the learning experience, engage students and provide access to various educational resources [14], [15], [16]. The use of digital technology in the learning process can increase students' interest and motivation to learn, the quality of the learning process and learning outcomes [17]. The use of social media as a presentation medium for digital educational content helps users gain new knowledge and insights and also helps users understand educational or digital learning materials presented on social media platforms [18].

This bibliometric analysis aims to map the development of research related to digital learning from year to year as well as influential authors in writing articles related to digital learning. This bibliometric analysis also maps the development of related keywords apart from the digital learning keyword.

## 2    Method

This research using descriptive research methods, this research aims to identify bibliometrics from published journal articles. The data used is Scopus data using the keyword "digital learning". Bibliometric analysis in descriptive research itself aims for journals to carry out internal evaluations and form publication policies that are in accordance with the relevant journals. Another goal for researchers is that it allows researchers to access various sources that are appropriate to the research areas that each researcher is interested in or plans to focus on in their future research [19].

### 2.1    Data Collection

Data in this research was collected through the Scopus database using the option and keyword "Digital Learning". The results were found to be 5021. The next stage focused again on the research objectives, only articles would be analyzed and a total of 2460 articles were found, then limited to the social science domain and the result was 1771. The final stage limited the focus to articles published in 2017-12-09-2023. result 1447. The filtered data is then exported in CSV form.

### 2.2    Data Analysis

The articles gathered within the scope of the study were analyzed using the R-Studio program. The R program is provided at the official storage website of many bibliometric analysis packages at https://cran.r-project.org/. The package programs that are used for bibliometrical analyses are efficient in quantitative research. The data

was first exported to biblioshiny, which is a web interface in the bibliometric R program package for analysis [19].

Data that has been filtered according to the intended research option is then exported from the Scopus database in CSV format and then goes through the analysis stage via Biblioshiny. First open RStudio and install the "Bibliometrix" package then run it. After running it, you will be directed to the website "Biblioshiny: the shiny opp for Bibliomtrix" in the R program Packages Bibliometrix. To analyze CSV data that has been exported, select "Load Data", enter the source data base file, select the file that has been exported and run it.

## 3      Findings and Discussion

**Table 1.** Statistic research data information

| Main information about data | |
| --- | --- |
| Timespan | 2017-2023 |
| Sources (journal) | 574 |
| Documents (articles) | 1447 |
| Authors | 4214 |

**Table 2.** Growth and citation article 2017-2023

| Years | N article | Mean citation/article | Mean citation/years |
| --- | --- | --- | --- |
| 2017 | 71 | 19.2 | 2.70 |
| 2018 | 97 | 22.4 | 3.69 |
| 2019 | 127 | 13.32 | 2.63 |
| 2020 | 227 | 13.52 | 3.30 |
| 2021 | 302 | 13.11 | 4.24 |
| 2022 | 339 | 3.97 | 1.88 |
| 2023 | 284 | 0.89 | 0.82 |

The growth in the number of articles about digital learning published from 2017 was 71 article documents. The development of published articles experienced a quite large increase starting from 2019 to 2020 where the whole world experienced a Covid-19 lockdown where many activities are carried out online, especially in the realm of education. After the Covid-19 pandemic, learning has become an interesting topic of discussion in situations where learning is done anywhere and provides other options in the learning process, for example blended learning.
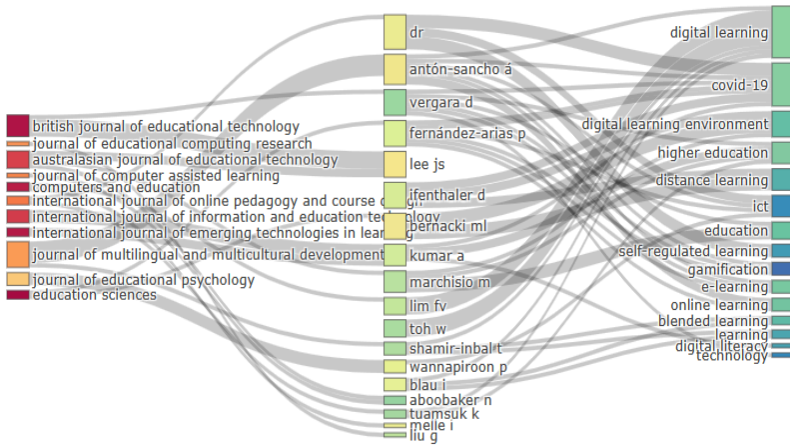
**Fig. 1.** There-field plot

Figure 1 shows the relationship of the three fields, the left column shows the relationship between journal sources, in the middle shows the relationship between authors and keywords and on the right shows the relationship between frequently used keywords and authors. In the right column, the keywords "digital learning" and "Covid-19" are the keywords most used by authors, which are almost used by all authors in the column in the middle of the graph. Then kumar.a became the author with the highest relationship with the publishing journal. The Australasian Journal of Educational Technology is connected to various authors in the middle column.
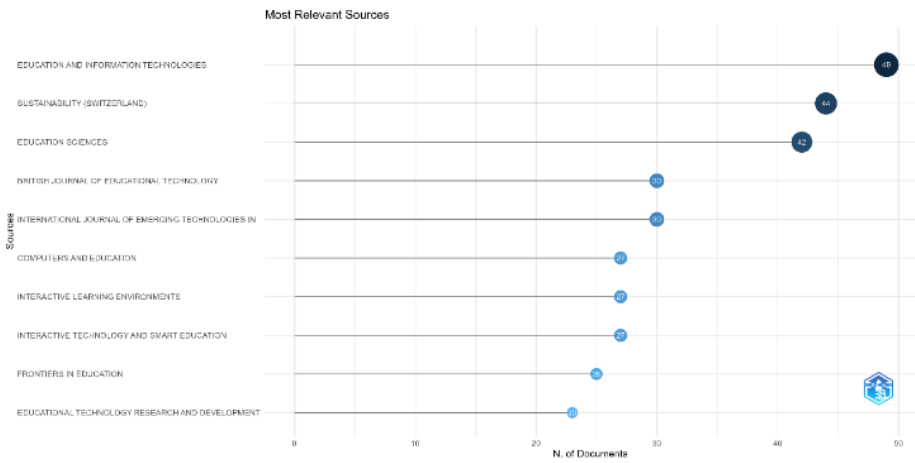


**Fig. 2.** Most relevant sources

Figure 2 provides information regarding the ranking of the top 10 journals from publishers of articles about digital learning. The Education and Information

Technology journal is the largest publisher of articles about digital learning with 49 articles published, then the Sustainability journal (Switzerland) with 44 articles, Education sciences 42 articles were published. The British journal of educational technology and international journal of emerging technologies with 30 articles. Next computers and education journal with 27 articles.
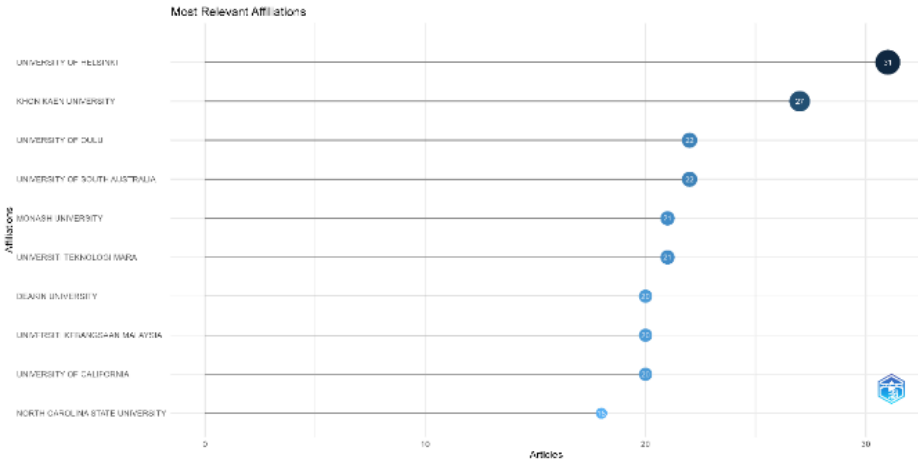


**Fig. 3.** Most relevant affiliations

Figure 3 displays the 10 highest universities with the number of articles published on digital learning. The University of Helsinki has the highest number of published articles on digital learning. The results of the top 10 universities, three of which are in Australia, then two are located in Finland, America and Malaysia. One of the top 10 universities is in Thailand.



**Fig. 4.** Co-occurrence network

Figure 4 shows six color clusters and the network that connects keywords. The size of the circles varies depending on the relationship between one word and another word. The greater the relationship between a word and other words, the larger the color circle will be. Based on the Co-occurrence Network image, keywords from the author of the article about "digital learning" have the highest relationship with other keywords, followed by other keywords such as covid-19, higher education, e-learning, online learning.
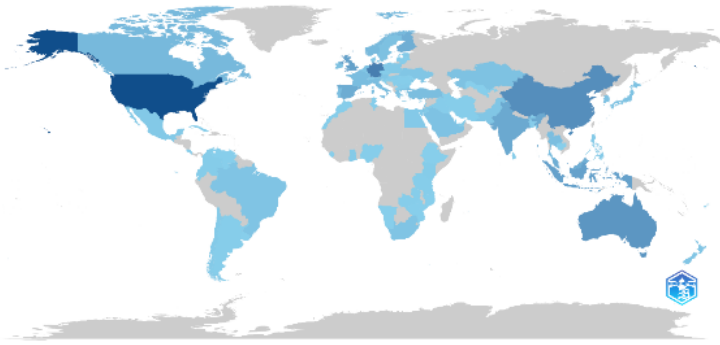


**Fig. 5.** Country scientific production

Over a period of approximately six years, digital learning article documents have been published by various researchers from many countries. Areas with a darker blue color indicate that more article documents are being published. Based on Figure 4, it shows that the United States published 593 articles, followed by Germany with 356 articles, Australia 257, Indonesia 242 then China with 240 articles and articles, there is also England which published 187 articles and Spain 157.

## 4    Conclusion

Development of published articles experienced a quite large increase starting from 2017 to 2023. Digital learning has developed rapidly since the 21st century, based on the findings of Scopus data analyzed in the last 7 years, namely from 2017-2023 published articles increased every year. The results of the relationship between three fields consisting of keywords, author and affiliation found that the keywords "Digital Learning" and "Covid-19" were the keywords most used by authors, which were almost used by all authors in the column in the middle of the graph. Then kumar.a became the author with the highest relationship with the publishing journal.

Then, Education and Information Technology journal is the largest publisher of articles about digital learning, with 49 articles published. University of Helsinki is the highest in the number of digital learning articles published. The analysis results of the keyword "digital learning" show 6 network clusters, namely covid-19, higher education, e-learning, online learning.

Digital learning is a hot topic of discussion at this time, various types of facilities, systems and models continue to develop in learning. The rapid development of technology and information also encourages learning by utilizing technology. Currently, digital learning provides a lot of inspiration, especially in the field of education, that there are new forms of learning. The use of technology in education will continue to develop and become an interesting topic of discussion in line with developments in available technology.

# References

1. S. K. Basak, M. Wotto, and P. Bélanger, "E-learning, m-learning and d-learning: Conceptual definition and comparative analysis," E-Learning Digit. Media, vol. 15, no. 4, pp. 191–216, Jul. 2018, doi: 10.1177/2042753018785180.
2. M. Chen and C. Volpe Martincus, "Digital technologies and globalization: A survey of research and policy applications," Washington, D.C., Mar. 2022. doi: 10.18235/0004117.
3. M.-H. Lin, H.-C. Chen, and K.-S. Liu, "A study of the effects of digital learning on learning motivation and learning outcome," Eurasia J. Math. Sci. Technol. Educ., vol. 13, no. 7, pp. 3553–3564, Jun. 2017, doi: 10.12973/eurasia.2017.00744a.
4. O. D. Bakare and N. Okuonghae, "Digital technologies and resources for learning under lockdown," in Impact of Disruptive Technologies on the Socio-Economic Development of Emerging Countries, IGI Global, 2023, pp. 87–103. doi: 10.4018/978-1-6684-6873-9.ch006.
5. U. Trautwein and B. Nagengast, "Digitization will bring profound changes in educational practice and research on motivation," in Motivation Science, Oxford University PressNew York, 2023, pp. 441-C10.3P26. doi: 10.1093/oso/9780197662359.003.0072.
6. D. Shah, "Here are 850+ Ivy League courses you can take right now for free," TheCodeCamp. Accessed: Feb. 18, 2023. [Online]. Available: https://www.freecodecamp.org/news/ivy-league-free-online-courses-a0d7ae675869/
7. B. Arisoy, "Digitalization in education," Cypriot J. Educ. Sci., vol. 17, no. 5, pp. 1799–1811, May 2022, doi: 10.18844/cjes.v17i5.6982.
8. S. Elkington, "Shifts in pedagogy and flexible assessment: integrating digital technology with good teaching and learning practice," in The Emerald Handbook of Higher Education in a Post-Covid World: New Approaches and Technologies for Teaching and Learning, Emerald Publishing Limited, 2022, pp. 153–171. doi: 10.1108/978-1-80382-193-120221007.
9. Organisation for Economic Co-operation and Development, 21st-century readers: Developing literacy skills in a digital world. Organisation for Economic Co-operation and Development, 2021. [Online]. Available: https://www.oecd.org/publications/21st-century-readers-a83d84cb-en.htm
10. C. A. Cholik, "Perkembangan teknologi informasi komunikasi/ICT dalam berbagai bidang," J. Fak. Tek. Kuningan, vol. 2, no. 2, pp. 39–46, 2021.
11. S. Alneyadi, E. Abulibdeh, and Y. Wardat, "The impact of digital environment vs. traditional method on literacy skills; Reading and writing of Emirati fourth graders," Sustainability, vol. 15, no. 4, p. 3418, Feb. 2023, doi: 10.3390/su15043418.
12. E. F. Rusydiyah, E. Purwati, and A. Prabowo, "How to use digital literacy as a learning resource for teacher candidates in Indonesia," J. Cakrawala Pendidik., vol. 39, no. 2, pp. 305–318, Jun. 2020, doi: 10.21831/cp.v39i2.30551.

13. M. Laufer et al., "Digital higher education: a divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality," Int. J. Educ. Technol. High. Educ., vol. 18, no. 1, p. 51, Dec. 2021, doi: 10.1186/s41239-021-00287-6.

14. M. Shvardak, "Digital interactive technologies in educational process of primary school," Sci. J. Khortytsia Natl. Acad., no. 2023–8, pp. 39–48, May 2023, doi: 10.51706/2707-3076-2023-8-3.

15. V. Semina and G. Semin, "Application of modern digital technologies in education," in 2023 3rd International Conference on Technology Enhanced Learning in Higher Education (TELE), IEEE, Jun. 2023, pp. 163–165. doi: 10.1109/TELE58910.2023.10184328.

16. O. Pylypenko and O. Shuliak, "Improvement information and digital competence teachers in the conditions of digitalization of education," in The development of innovations and financial technology in the digital economy, Scientific Center of Innovative Research, 2023, pp. 147–168. doi: 10.36690/DIFTDE-2023-147-168.

17. N. Hidayat and H. Khotimah, "Pemanfaatan teknologi digital dalam kegiatan pembelajaran," JPPGuseda | J. Pendidik. Pengajaran Guru Sekol. Dasar, vol. 2, no. 1, pp. 10–15, Mar. 2019, doi: 10.33751/jppguseda.v2i1.988.

18. Y. Fitriani, "Pemanfaatan media sosial sebagai media penyajian konten edukasi atau pembelajaran digital," J. Inf. Syst. Applied, Manag. Account. Res., vol. 5, no. 4, pp. 1006–1013, 2021, [Online]. Available: https://journal.stmikjayakarta.ac.id/index.php/jisamar/article/view/609

19. A. Bayrak and S. Aslanci, "Realistic mathematics education: A bibliometric analysis," Shanlax Int. J. Educ., vol. 10, no. 4, pp. 52–62, Sep. 2022, doi: 10.34293/education.v10i4.5174.