

Bibliometric Analysis of Technology Trends in Education: Analysis from 2018 to 2022

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ABSTRAK

Teknologi sebagai kebutuhan dasar setiap orang sehingga bisa dikatakan bahwa antara inovasi pendidikan dengan teknologi pendidikan adalah satu kesatuan yang tidak dapat dipisahkan dan menyebabkan penggunaan teknologi dalam lingkup pendidikan merupakan sebuah keharusan untuk mencapai pendidikan yang lebih maju dan berkualitas. Oleh karena itu, menjadi penting untuk mengetahui perkembangan teknologi yang ada dalam lingkup pendidikan agar dapat menjadi dasar bagi pengembangan teknologi dalam pendidikan kedepannya. Tujuan penelitian ini adalah untuk menganalisis dan mengetahui tren penelitian teknologi dalam bidang pendidikan pada 5 tahun terakhir dimulai 2018 hingga tahun 2022. Pada penelitian ini menggunakan analisis bibliometrik yang merupakan alat analisis statistik kuantitatif yang sering digunakan untuk memberikan analisis terhadap publikasi yang telah ada dengan bantuan VOSviewer untuk memvisualisasikan data dan menggunakan database yang ada di scopus. Kemudian, berdasarkan hasil analisis diperoleh 547 publikasi dalam rentang 5 tahun yaitu mulai dari 2018 hingga tahun 2022, selanjutnya juga telah diperoleh tren penelitian teknologi dalam pendidikan yang berkaitan dengan publication growth and leading affiliations, leading country and subject area, the most source title, the most cited source, the most cited authors, dan keywords co occurrences analysis. Selain itu, penelitian ini memberikan kontribusi dan juga membuka peluang bagi peneliti kedepannya agar dapat melakukan penelitian terkait teknologi dalam pendidikan yang jumlahnya masih sedikit pada area density visualization.

ABSTRACT

Technology is a basic need of everyone so it can be said that educational innovation and educational technology are inseparable whole and causes the use of technology in the scope of education to be a must to achieve a more advanced and quality education. Therefore, it is important to know the development of technology in the scope of education so that it can be the basis for technological development in education in the future. The purpose of this study is to analyze and find out the trends of technology research in the field of education in the last 5 years starting from 2018 to 2022. This study uses bibliometric analysis which is a quantitative statistical analysis tool that is often used to provide analysis of existing publications with the help of VOSviewer to visualize data and use databases in Scopus. Then, based on the results of the analysis, 547 publications were obtained in the span of 5 years, starting from 2018 to 2022, furthermore, technological research trends in education related to publication growth and leading affiliations, leading country and subject area, the most source title, the most cited source, the most cited authors, and keywords co occurrences analysis. In addition, this research contributes and also opens up opportunities for future researchers to be able to conduct research related to technology in education, which is still small in the density visualization area.

1. INTRODUCTION

Science is growing from time to time including technology that makes humans move by thinking tactically, and innovating quickly also precisely. This can be observed in the development of the use of technology in every aspect of life, one of which is education (Abbas et al., 2021; Salsabila et al., 2020). This makes technology a basic need for everyone so that it can be said that between educational innovation and educational technology is a unity that cannot be separated (Salsabila & Agustian, 2021). As in the 21st century, when information and technology have dominated all aspects of life including affecting education, therefore every element in the scope of education must be responsive in adapting to this rapid development (Bratland et al., 2022; Elmira et al., 2022). Being responsive to changing times also means having to understand what the dynamics of education are demanding that will continue to develop (Galvis & Carvajal, 2022). One of the demands of changing times itself includes the use of technology in the world of education which is very much a necessity in the era of globalization, quickly respond to it so that education continues to develop and can adapt to the needs of an increasingly rapidly uncontrolled era and because the modern education system is also determined by the development of the application of technology (Inesh et al., 2022). Thus, the use of technology in education is a must in order to achieve progress and convenience in the world of education (Haryanto, 2015). Educational technology has a significant role in the design, development and utilization of various learning resources so that it can facilitate and accommodate someone to learn regardless of space and time in any way and learning resources that suit their conditions and needs (Elihami & Saharuddin, 2018). This is because technology has a central position in transforming education (Photopoulos & Triantis, 2022). Furthermore, improving the quality of learning can also be done using educational technology media (Siregar, 2020). In addition, it is also useful to provide a clearer explanation of the material, learning methods become more varied and communicative, and students can carry out activities during learning activities, not only quietly listening but can observe, demonstrate and act out so that the desired results are achieved (Padmini & Atika, 2015; Rahmaniah, 2022). Then it can also foster student learning motivation, increase student academic success, and improve skills, as well as to help students become digitally literate citizens who can cope with complexity and dynamics in today's society (Scherer, Siddiq, & Tondeur, 2019; Shubina et al., 2021). Therefore, teachers and students need technology for the teaching and learning process (UNSDG, 2020). Thus, the role of technology in the world of education is increasingly visible and needed (Fania et al., 2021). The role of all parties in the world of education must be able to keep pace and follow existing technological advances, baik pihak stakeholder, pemimpin pendidikan, akademik, guru, siswa dan orang tua perlu berusaha beradaptasi dengan setiap perubahan maupun kemajuan yang dibutuhkan dalam pendidikan (Maritsa, et al., 2021; Yerahmetkyzy et al., 2022). Especially teachers need to utilize technology in organizing learning activities that are taught and understand that such learning strategies greatly support or help the level of mastery of students over the subject matter (Lestari, 2015; Murzatayeva et al., 2022). Coupled with the phenomenon of the COVID-19 pandemic, education actors are required to switch to the use of communication technology and internet networks on a large scale, so that various media from the results of technology have been used in education because of its benefits, such as the Zoom application, Google Meet, Google Classroom, Teamlink, Cisco Webex, and other supporting applications that use the internet network to carry out the learning process (Ali et al., 2021; Salsabila et al., 2020). In this crisis, such digital technologies help keep the education system afloat (Haleem et al., 2022).

With this pandemic, education also requires teacher competence in choosing media and using educational technology as a learning facility and being able to improve their online learning (Churiyah et al., 2020; Susanto et al., 2022). To do so, digital competence for teachers is very important (Marimon-Martí et al., 2022). As the phenomenon experienced during the COVID-19 pandemic, especially for teachers, is the mastery of technology and the selection of technological methods and media that will be used to suit the conditions and needs of students. It is also shown that many schools still show a lack of experience and ability in the use of technology in learning activities, resulting in widening gaps, inequalities, and learning losses. Thus, it raises the need for schools to learn and improve the capacity and readiness of their technological competencies to achieve successful digital transformation. Given that the integration of technology in education is a complex and ongoing process that impacts various actors within the field of education (Timotheou et al., 2022).

This study uses bibliometric analysis to review large amounts of data in a field or publication using quantitative techniques (Donthu et al., 2021). As it is known that according to Ishak et al., (2022) In his research, it is known that the use of technology in the field of education has been carried out. Then according to Maritsa et al., 2021 In his research, technology is also a supporting tool used in education to make it easier for teachers to teach students with the results to be achieved. Therefore, this study aims to analyze trends from research related to the phenomenon of applying technology in education, which is

also reinforced by Alghamdi (2020) That the trend can help improve the teaching and learning process because there are benefits and also increase student interest in learning and can affect future research. The use of bibliometrics is because it can know after the article is published how much influence it has, and how the impact of the selected article on future research (Cooper, 2015).

2. METHOD

This study uses bibliometric analysis which is a quantitative statistical analysis tool that is often used to provide analysis of existing publications (Cooper, 2015; Ellegaard & Wallin, 2015). The purpose of this study is to analyze and find out the trend of technology research in the field of education in the last 5 years starting from 2018 to 2022. Then to analyze the data from scopus database using the help of VOSviewer which is a program developed to create and view bibliometric maps (van Eck & Waltman, 2010). After analyze the data from scopus, the next step is to explain all the data.

This research collects documents in the Scopus database using special keywords, namely "technology in education" and the document limit is only specific to 2018 to 2022. In the findings, 547 publication documents related to these keywords were obtained, namely 410 article publications, then 137 other publications consisting of conference paper, review, editorial, book chapter, book, erratum, and note. Furthermore, the research question is about the analysis of publication growth and leading affiliations, leading country and subject area, the most source title, the most cited source, the most cited authors, and keywords co occurrences analysis. Thus, technology research trends in education can be known from 2018 to 2022.

3. RESULT AND DISCUSSION

Result

The results of bibliometric analysis based on database documents from Scopus include: *documents by year, document by affiliation, document by country, document by subject area, and document by source title, most productive author* by using special keywords, namely "technology in education" So obtained 547 publications related to these keywords. From the database obtained some information which has then been analyzed related to *publication growth and leading affiliations, leading country and subject area, the most source title, the most cited source, the most cited authors, and keywords co occurrences analysis*. The development of technology publications in the field of education starts from 2018 to 2022 with a total of 547 publications shown in Figure 1.

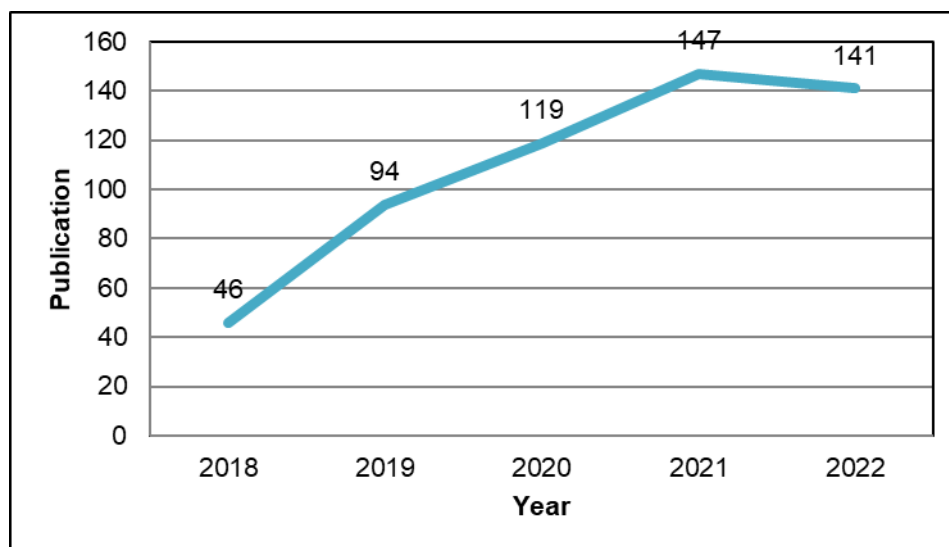


Figure 1. Publication Growth Technology in Education from 2018 to 2022

From the picture above, it is known that the development of technology publications in the field of education continues to increase until 2021, but in 2022 there is a decrease in the number of publications, which is only 141 and 2021 is the year with the highest number of publications, which is 147. Then from the 547 publications that exist, it is also known that there are 160 affiliates who have

contributed, which then selected 10 affiliates with the highest number of publication contributions, as shown in [Figure 2](#).

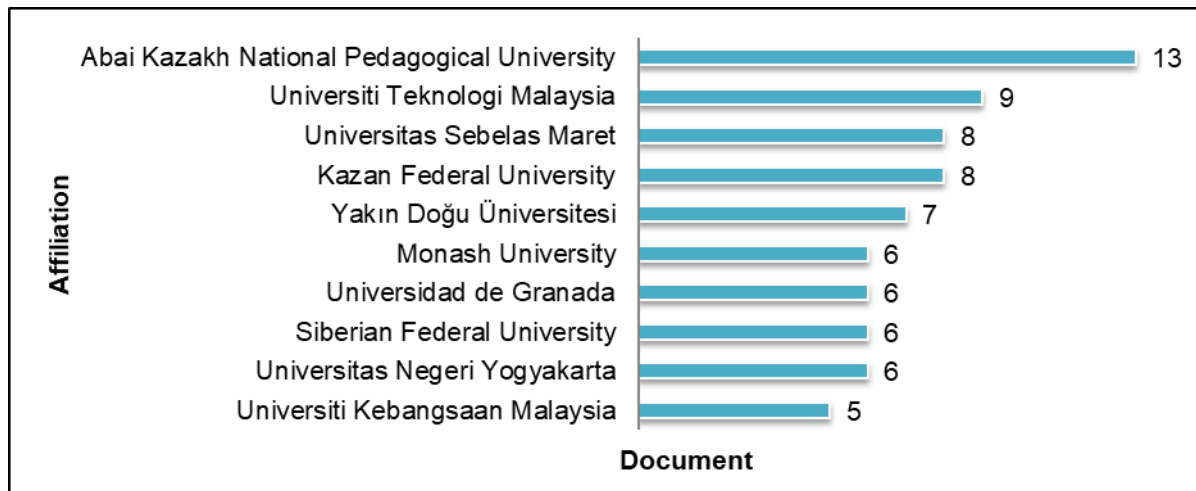


Figure 2. Top 10 Most Contributing Affiliates

From the figure above, it is known that the first of the most contributing affiliates is Abai Kazakh National Pedagogical University contribute as much as (2,37 %), Next Universiti Teknologi Malaysia (1,64 %), Universitas Sebelas Maret (1,46%), Kazan Federal University (1,46%), Yakın Doğu Üniversitesi (1,27%), Monash University (1,09%), Universidad de Granada (1,09%), Siberian Federal University (1,09%), Universitas Negeri Yogyakarta (1,09%), and Universiti Kebangsaan Malaysia (0,91%). The number of countries that have contributed to publications related to technology in education is 87 countries, then after analysis there are 10 countries that have contributed the most shown in [figure 3](#).

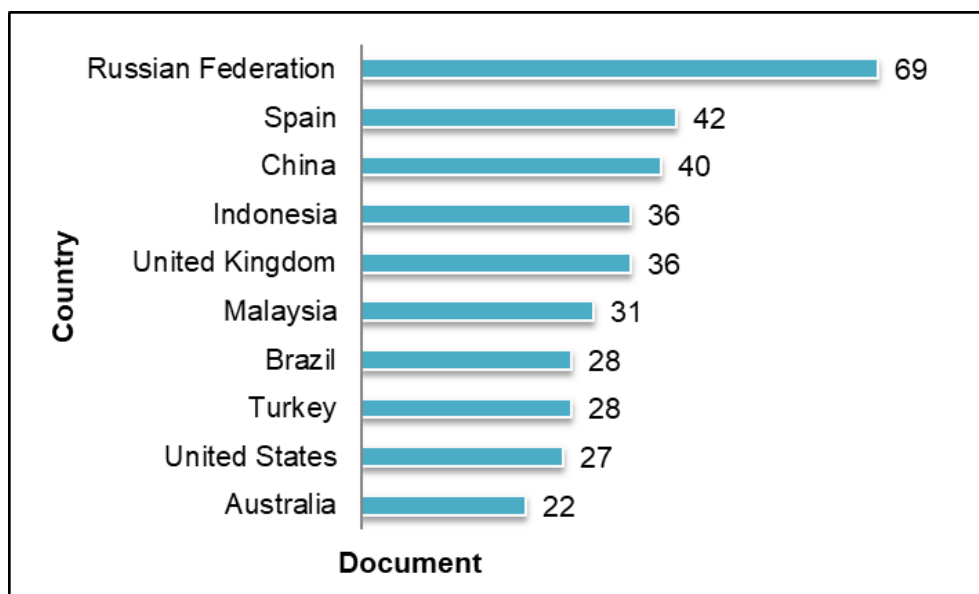


Figure 3. Top 10 Most Contributing Countries

Based on the [Figure 3](#), it can be seen that the country Russian Federation Being the most contributing country is as much as (12,61%), then Spain as (7,67%), China (7,31%), Indonesia (6,58%), United Kingdom (6,58%), Malaysia (5,66%), Brazil (5,11%), Turkey (5,11%), United States (4,93%), and Australia as (4,02%). Then from the results of the analysis also obtained 28 various subject areas that have been published, here is [Figure 4](#) which shows the top 10 subject areas that contribute the most. Top 10 Subject Area showed in [Figure 4](#).

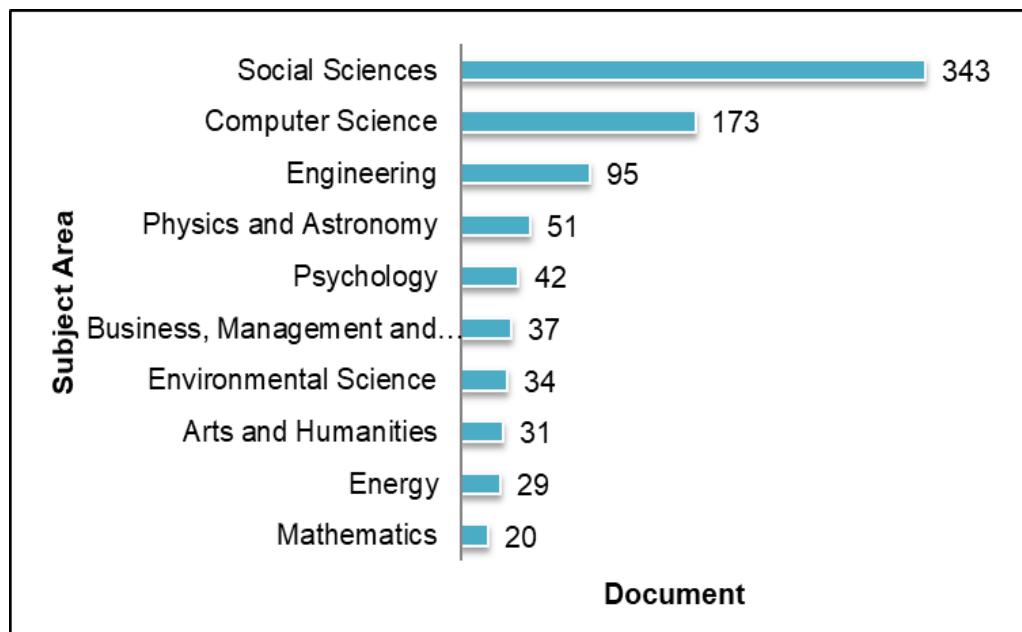


Figure 4. Top 10 Subject Area

Based on this figure, it is known that social sciences, which includes the field of education, occupies the first position with 343 publications or 62.7% of the total number of publications from 2018 to 2022. Based on the results of the scopus database analysis, it is known that publications using special keywords “technology in education” To find out the trend of research on technology in education that has been published, information on the Top 10 Source Title shown in Table 5.

Table 5. Top 10 Source Titles

| No. | Source Title | Total Document | Percentage(%) |
|-----|---|----------------|---------------|
| 1 | Journal Of Physics Conference Series International Journal Of Emerging Technologies In Learning | 34 | 6,22 |
| 2 | E3s Web Of Conferences | 24 | 4,39 |
| 3 | Education And Information Technologies | 14 | 2,56 |
| 4 | Sustainability Switzerland | 13 | 2,38 |
| 5 | International Journal Of Interactive Mobile Technologies | 13 | 2,38 |
| 6 | Education Sciences | 9 | 1,65 |
| 7 | Iop Conference Series Materials Science And Engineering | 8 | 1,46 |
| 8 | World Journal On Educational Technology Current Issues | 8 | 1,46 |
| 9 | Frontiers In Education | 8 | 1,46 |
| 10 | | 6 | 1,10 |

Based on the table above, it is known that the Journal Of Physics Conference Series is the source title with the most contributions, with 34 publication documents or 6.22% of all total existing publications. Then, the Top 10 most cited sources are shown in Table 6.

Table 6. Top 10 Most Cited Sources

| No. | Source | Document | Citations |
|-----|--|----------|-----------|
| 1 | Computers and education | 5 | 703 |
| 2 | Applied sciences (Switzerland) | 3 | 177 |
| 3 | International Journal of Emerging Technologies in Learning | 24 | 140 |
| 4 | International Journal of Interactive Mobile Technologies | 9 | 105 |
| | Education and information technologies | 13 | 99 |
| 6 | Education sciences | 8 | 95 |

to publications with a total of 343 or 62,7%. Also known, the most source title is Journal Of Physics Conference Series, the most cited source is Computers and education with the number of citations 703, and the most cited author is Tondeur J with 777 citations. In network visualization, it is known that there are 48 keywords related to technology in education which are divided into 7 clusters, and in overlay visualization, it is known that 2021 is the year of the trend of technology publications in education since the last 5 years starting from 2018 to 2022. Then in density visualization, there are still various keywords that are still not widely studied as shown by the dark color of the keywords, as for the 18 keywords, including digital competence, teacher training, professional development, innovation, online, digital technology, digital literacy, teacher, gamification, mixed reality, artificial intelligence, systematic review, sustainability, blockchain, information technology, teaching, digital transformation, dan digital technologies in education. From all the keywords that have been used, this can be an opportunity to implement keywords related to technology in the field of education in the future. Technology allows easy and fast access to a variety of educational resources. Technology allows personalization of learning so that each student can learn according to their own pace and learning style (Aeni & Yusupa, 2018; Daniel & Kamioka, 2017; Nisa', 2020). This can increase student understanding and engagement (Bajrami & Ismaili, 2016; Daryanes et al., 2023; Ge et al., 2021). As is known, that with the rapid development and also changes in technology in the current era of globalization have had a significant impact and influence on almost the entire life including the world of education (Astuti et al., 2021; Korucu & Alkan, 2018; Kounlaxay et al., 2021; Lestari, 2015).

Education began to be required to provide freshness in every learning process by utilizing existing technology. The influence of technology has urged education players to compete and make innovations and new colors in education (Barnes et al., 2019; Rahim et al., 2020; Yaacob & Saad, 2020). Therefore, technology can help the learning process (Asmi et al., 2018; Candra Sari et al., 2022; Padmini & Atika, 2015). Innovations and technological advances have also changed pedagogy and approaches to facilitate and deliver teaching in education (Indah Septiani et al., 2020; Muafiah et al., 2022; Park et al., 2020). As for the other thing, namely, from keywords that are still small in the number of research, this can be an opportunity for further research in order to raise the topic of technology research in education related to these keywords. Also, keywords that are still small in the number of research, can be an opportunity for further research to be able to raise the topic of technology research in education related to these keywords.

4. CONCLUSION

The trend of technology research in education in the range of 2018 to 2021 always increases in the number of research, but in 2022 it has decreased but not significantly. Then, this research trend has been quite widely carried out by various journals in various countries and 48 keywords are discussed in articles related to technology in education, although there are still keywords that are still rarely discussed in the research trend so that it can be a research opportunity to raise topics related to these keywords. Then, because this research uses special keywords "technology in education" to obtain documents from the Scopus database, the research has the disadvantage that it does not fully contain documents related to technology in education that already exists, because Scopus does not fully cover all available publication documents. So, this study only explains the trend of technology research in education starting from 2018 to 2022 by utilizing the database in Scopus.

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