



RESEARCH ARTICLE

Artificial Intelligence in Education Quality: Bibliometric AnalysisNesrin M. Bahçelerli^{1*}, Esen Sucuoğlu²^{1,2} Near East University, Faculty of Tourism, Nicosia, North Cyprus, Mersin 10 Turkey**ARTICLE INFO****ABSTRACT**

Received: May 22, 2024

Accepted: Jun 27, 2024

Keywords

Artificial Intelligence

Education

Quality

Bibliometric Analysis

Technological developments have gained momentum in our day and artificial intelligence applications have started to be applied and researched in every field. As the field of artificial intelligence has started to show its effect in almost all existing sectors, it has also started to be researched and used in educational sciences. In this study, the studies in the Web of Science database were analyzed within the scope of the keywords 'artificial intelligence' and 'education quality'. As a result of the analyses, 87 studies were accessed. The studies were analyzed on the basis of co-author, keyword, citation, year and country. These studies were conducted in different countries and on many different subjects. Collecting all these academic studies in a common study and creating an information network will facilitate researchers in new studies.

***Corresponding Author:**

nesrin.menemenci@neu.edu.tr

INTRODUCTION

Today, rapidly developing technology has increased the capabilities of computers in terms of hardware and software. This has led to the acceleration of artificial intelligence studies and the expansion of its application areas (Makridakis, 2017). While artificial intelligence has shown its impact in all areas of industry, it has changed the perspective of education systems to train qualified human resources (Chen et al., 2020). In the past, the expectation of more intensive and long hours of physical activities was replaced by digital literacy, creativity, innovative and critical thinking, analysis, synthesis and evaluation skills, and the increasing preference of individuals with digital literacy, creativity, innovative and critical thinking, analysis, synthesis and evaluation skills in the business world, and states need to take artificial intelligence systems into account when organizing development plans and education systems (Roll & Wylie, 2016). Artificial intelligence systems have influenced changes in the type of people that education is expected to educate, as well as bringing about updates in the goals of education, curriculum, functioning and organization of systems, and increasing the use of fields such as distance education, online learning, augmented reality, virtual reality (Chen et al., 2022; Udvaros & Forman, 2023).

The information network obtained by analyzing artificial intelligence-supported academic studies written in the field of educational sciences facilitates the work of researchers. With the combination of the results achieved in the field of education quality and artificial intelligence, it will help to observe the common conclusions of the previously covered topics and at the same time to identify the deficiencies and unexplored points. When the literature was examined, it was determined that there was no study on the bibliometric analysis of artificial intelligence studies written in terms of

educational quality. Bibliometric analysis was carried out and the studies on this subject were examined and analyzed.

In this study, it is aimed to analyze the studies on educational quality and artificial intelligence in Web of Science databases. The systematic presentation of all these studies on artificial intelligence and quality of education will facilitate new researches. The studies on educational quality and artificial intelligence were analyzed in terms of year, authors, keywords, country and number of citations. The lack of research in this direction is important in terms of guiding new studies and contributing to the literature.

AI and education quality

Studies on the adaptation of artificial intelligence software and applications to education and training processes and benefits continue day by day. Many countries have developed different teaching programmes as well as transferring artificial intelligence education to curricula. In addition to being used not only within the course processes, the benefits of teaching it as an extra course are also emphasized (Hwang et al., 2020; Wang & Li, 2024).

Integrating artificial intelligence into education has many positive effects. Artificial intelligence has the potential to significantly improve the quality of education. AI-powered learning tools offer students personalized learning experiences that adapt to their individual needs and learning pace. In this way, students can understand subjects more deeply and progress at their own pace. In addition, AI-supported analyses and reports allow teachers to more easily identify their students' strengths and weaknesses and help them develop more effective teaching strategies (Chiu et al., 2023). Virtual teachers and intelligent course management systems also save teachers more time, reducing their workload and improving students' independent learning (Kuleto et al., 2021). However, there are some challenges in the use of AI in education. First, it is difficult for AI systems to be completely reliable and unbiased; errors or distortions in algorithms can provide students with incorrect or incomplete information (Hwnag et al., 2021). In addition, the overuse of technology can negatively affect the development of students' social skills and face-to-face communication skills. The digital divide also creates a major problem; students with limited access to technology due to economic or geographical reasons may not be able to benefit from such innovations and inequalities in education may further deepen (Luan et al., 2020). Finally, if teachers are not provided with adequate training and support to use AI technologies effectively, the effectiveness of these tools may be undermined (Jafari et al., 2024). All these challenges and benefits of AI directly affect the quality of education.

While ensuring equality in the educational environment, artificial intelligence can be used to provide quality and inclusive education and facilitate the work of educational administrators and teachers in many areas such as scheduling, student attendance and registration, course registration and management (Owoc et al., 2019; Oranga, 2023). It can be stated that artificial intelligence in education aims to provide inclusive, equitable, quality education and promote lifelong learning opportunities for all (Arruda & Arruda, 2024).

METHODOLOGY

This study was conducted using a qualitative research methodology and a document review of all academic studies in the Web of Science (WOS) database within the scope of the identified keywords. A number of exclusion and inclusion criteria were used through content analysis to decide which studies to include in the study. The research results obtained were categorized into various categories such as review and editing, and a scientific and transparent process was carried out (Choudhri et al., 2015; Donthu et al., 2021). The data obtained were analyzed using VosViewer software. In this research, a purposive sample selection was made. By searching the database using the keywords 'education quality' and 'artificial intelligence', 87 studies were reached.

Findings

The research data were analyzed under five headings. The data were analyzed on the basis of co-authors, keywords, citation, year and country.

Co-author distribution in studies

In the analyses using the keywords 'artificial intelligence' and 'education quality', the co-authors were examined first. The findings are as shown in Figure 1.

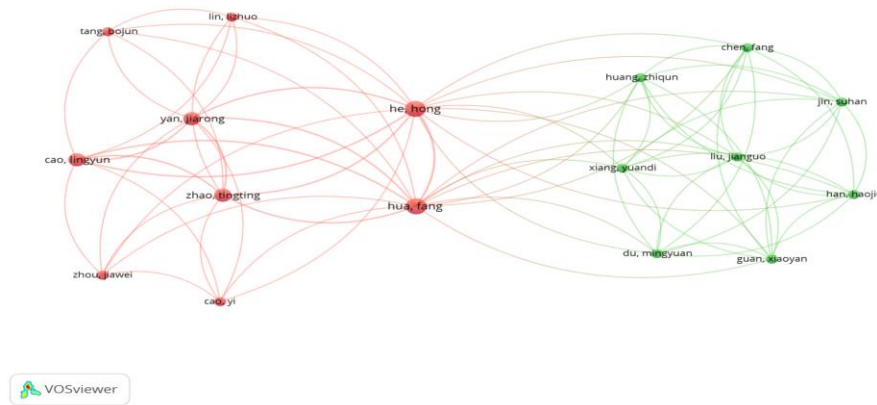


Figure 1: Co-author distribution of the studies

When the data obtained are analyzed, it is seen that the most common co-authors are Feng, Yongfu, Liu Chang, Wng Yuling, Li Juan.

Keywords used in research

When the keywords used in the studies are analyzed, it is seen that the most frequently used keywords are artificial intelligence, deep learning, technologies, prediction and artificial intelligence (ai).

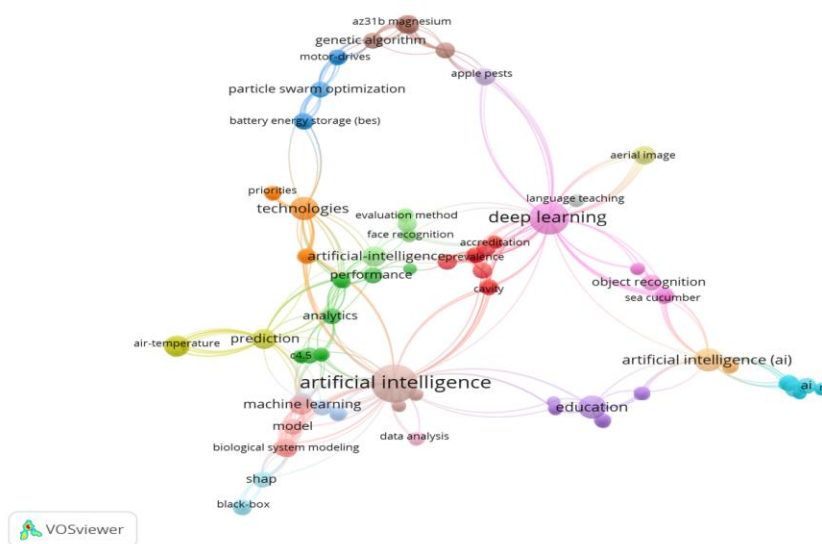


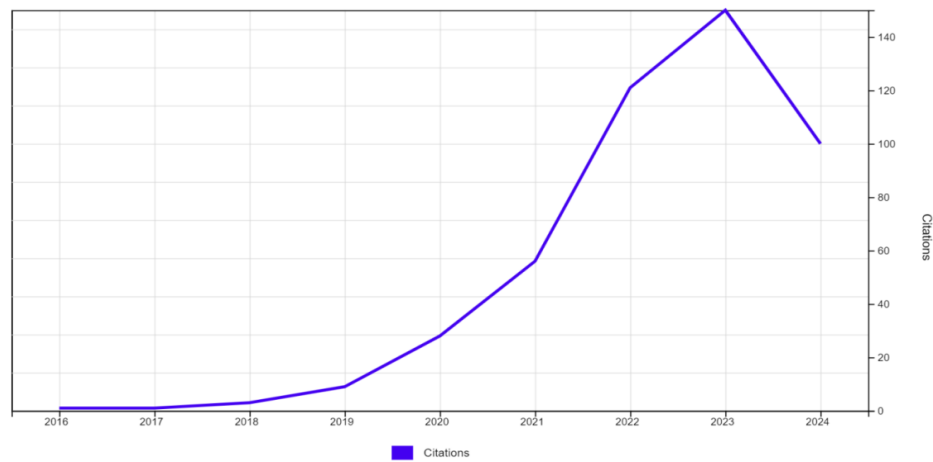
Figure 2: Keywords used in the studies

When Figure 2 is analyzed, it was determined that 'artificial intelligence' was used 68 times as a keyword, 'deep learning' 61 times as a keyword, 'technologies' 32 times as a keyword, 'prediction' 31 times as a keyword and 'artificial intelligence (ai)' 29 times as a keyword in 87 studies.

Citation rates of research

The citation rates of 87 studies accessed in line with the keywords used were analysed. The citation levels of the studies are as shown in Table 1.

Table 1: Citation rates of the studies

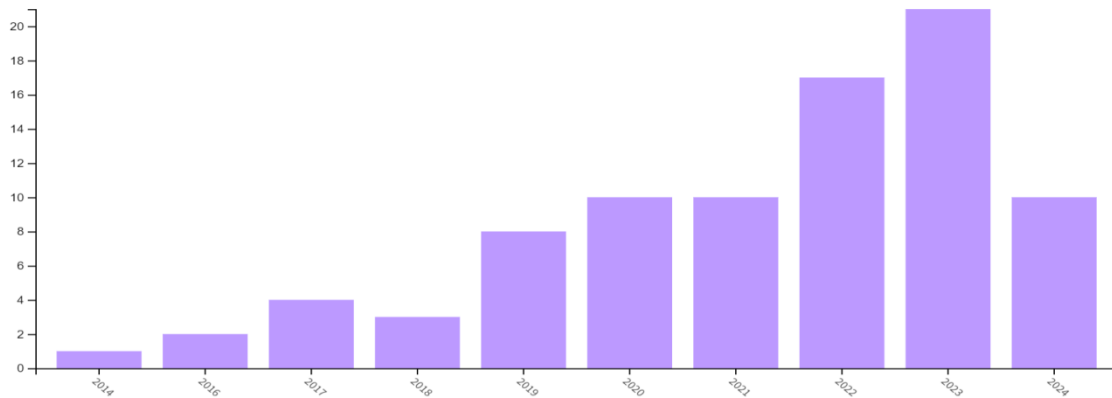


When the citation rates of the studies are examined in Table 1, it is seen that the studies and the related citation rates have increased as of 2016-2017. It was determined that the highest citation rate was in 2023.

Distribution of researches by year

The distribution of the studies conducted by years is shown in Table 2.

Table 2: Distribution of studies by year

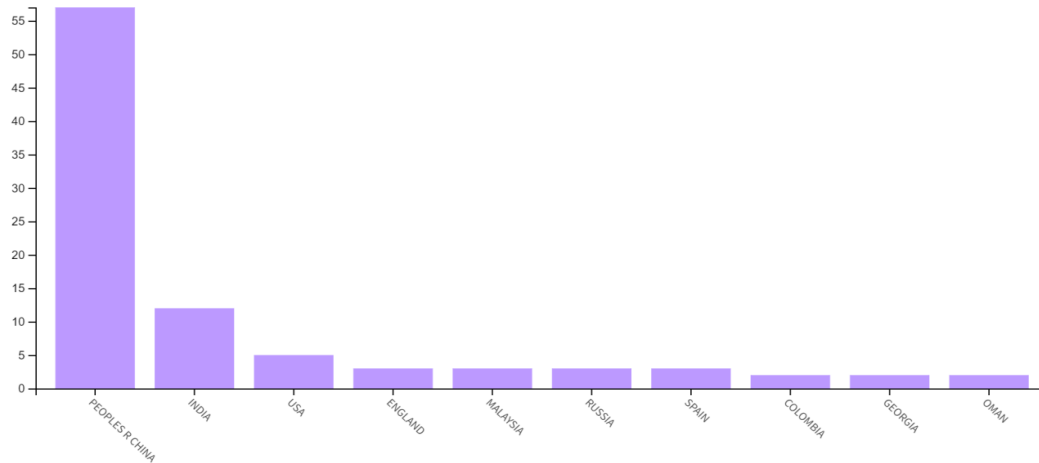


When the researchers conducted in the light of these words in the last five years are examined, it is determined that 8 researches were conducted in 2019, 10 in 2020, 10 in 2021, 17 in 2022, 21 in 2023 and 10 until June 2024. It is seen that the number of researches conducted on a yearly basis has increased.

Distribution of research by country

The country-based distribution of 87 researches based on the keywords within the scope of the research was analysed. As a result of the analysis, it was determined that the most publications were made in the People's Republic of China.

Table 3: Country distribution of studies



When the distribution of the studies according to the countries is analyzed, it is determined that the highest number of studies was conducted in the People's Republic of China with 57 studies. This is followed by India with 12 studies, USA with 5 studies and UK, Spain, Malaysia and Russia with 3 studies each.

CONCLUSION

This study focuses on the studies examining the effects of artificial intelligence, which is increasingly included in the research subject in educational sciences, on the quality of education. When the studies conducted within the scope of artificial intelligence and educational qualities in the literature are examined, it is seen that there is no study directly examining the educational quality of artificial intelligence. It was determined that 87 studies obtained within the scope of the research addressed the quality of education while examining artificial intelligence in education. This situation may be an opportunity for researchers to conduct new studies.

It is seen that the most common co-authors are Feng, Yongfu, Liu Chang, Wng Yuling, Li Juan. It is seen that the most frequently used keywords in the researches are artificial intelligence, deep learning, technologies, prediction and artificial intelligence (ai).

When the distribution of the researches obtained as a result of the analysis over the years is examined, it is determined that the number of researches has increased as of 2016. It is seen that the most publications were made in 2023. Similarly, it was concluded that the citation rates of the researches were the highest in 2023. When the researches were analysed on the basis of countries, it was determined that the most research was conducted in the People's Republic of China, followed by India.

LIMITATIONS AND FUTURE RESEARCH

The study has some limitations. Although all the researches within the scope of the keywords determined in the Web of science database were included in the research, it may be useful to analyze each of the researches as content. It may provide a different perspective on the development of

research in this direction. Collecting the scientific studies in a common study and creating an information network will facilitate the researchers in new studies. In future studies, it is recommended to investigate the relationship between the educational policies of the country, the use of artificial intelligence and the quality of education and its suitability for socio-economic level.

REFERENCES

- Arruda, E. P., & Arruda, D. P. (2024). Artificial intelligence for SDG 4 of the 2030 agenda: Transforming education to achieve quality, equality, and inclusion. *Sustainable Economies*, 2(2), 34-34.
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *Ieee Access*, 8, 75264-75278.
- Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two decades of artificial intelligence in education. *Educational Technology & Society*, 25(1), 28-47.
- Chiu, T. K., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4, 100118.
- Choudhri, A. F., Siddiqui, A., Khan, N. R., & Cohen, H. L. (2015). Understanding bibliometric parameters and analysis. *Radiographics*, 35(3), 736-746.
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of business research*, 133, 285-296.
- Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, 1, 100001.
- Jafari, F., & Keykha, A. (2024). Identifying the opportunities and challenges of artificial intelligence in higher education: a qualitative study. *Journal of Applied Research in Higher Education*, 16(4), 1228-1245.
- Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability*, 13(18), 10424.
- Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J., Ogata, H., ... & Tsai, C. C. (2020). Challenges and future directions of big data and artificial intelligence in education. *Frontiers in psychology*, 11, 580820.
- Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. *Futures*, 90, 46-60.
- Oranga, J. (2023). Benefits of artificial intelligence (ChatGPT) in education and learning: Is Chat GPT helpful. *International Review of Practical Innovation, Technology and Green Energy (IRPITAGE)*, 3(3), 46-50.
- Owoc, M. L., Sawicka, A., & Weichbroth, P. (2019, August). Artificial intelligence technologies in education: benefits, challenges and strategies of implementation. In *IFIP International Workshop on Artificial Intelligence for Knowledge Management* (pp. 37-58). Cham: Springer International Publishing.
- Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International journal of artificial intelligence in education*, 26, 582-599.
- Udvaros, J., & Forman, N. (2023). Artificial intelligence and Education 4.0. In *INTED2023 proceedings* (pp. 6309-6317). IATED.
- Wang, Y., & Li, Y. (2024). Chinese Vocational Skills Education Quality Assessment Using Attentive Dual Residual Generative Adversarial Network Optimised With Gazelle Optimisation. *International Journal of Robotics and Automation*, 39(10).