Vol. 13(3),2024, 238-246 DOI:10.23960/jppk.v13.i3.33728
Jurnal Pendidikan dan Pembelajaran Kimia
e-ISSN: 2714-9595| p-ISSN 2302-1772
http://jurnal.fkip.unila.ac.id/index.php/JPK/index

Analyzing the Potential of Artificial Intelligence in Enhancing Personalized Online Learning

Selara Waruwu[1], Widia Varidatul Mutoharoh[2], Siska Septiana[3], Putri Carlly[4], Muhammad Adib Alkhasna[5] , Abdul Rahman[6]

Program Studi Pendidikan Teknologi Informasi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Lampung, Jl. Prof. Dr. Soemantri Brojonegoro No. 1 Bandar Lampung, Indonesia.
*Correspondinge-mail: waruwuselara@gmail.com

Received: December 15th, 2024 Accepted: December 19th, 2024 *Online Published:* December 31th, 2024

Abstract: Analyzing the Potential of Artificial Intelligence in Enhancing Personalized Online Learning. The swift development of Artificial Intelligence (AI) has created new possibilities for revolutionizing online education, especially in offering more tailored learning experiences. This research intends to investigate how AI tools—like machine learning, natural language processing, and adaptive learning systems—can improve personalization in digital learning settings. By employing a bibliometric method using Publish or Perish and VOSviewer tools, this study examines trends in publications, key terms, and the contributions of various authors in the area. The results indicate a notable rise in academic interest regarding AI in the educational sector, particularly focusing on adaptive learning and student engagement. While this research is conceptual, the preliminary findings establish a strong basis for comprehending the future direction of AI integration and its vital importance in developing more effective, inclusive, and intelligent online learning platforms.

Keywords: Artificial Intelligence, personalized learning, online education, adaptive systems, educational technology.

Abstrak: Analisis Potensi Ai Dalam Meningkatkan Personalisasi. Pembelajaran Online Kemajuan yang cepat dalam teknologi Kecerdasan Buatan (Artificial Intelligence/AI) telah menciptakan kesempatan baru untuk merubah pendidikan daring, terutama dalam memberikan pengalaman belajar yang lebih dipersonalisasi. Penelitian ini bertujuan untuk menyelidiki potensi teknologi AI—seperti machine learning, natural language processing, dan sistem pembelajaran yang dapat beradaptasi—dalam memperbaiki personalisasi pembelajaran online. Dengan menggunakan pendekatan bibliometrik melalui aplikasi Publish or Perish dan VOSviewer, dilakukan analisis terhadap tren publikasi, kata kunci utama, serta kontribusi penulis di bidang ini. Hasil penelitian menunjukkan adanya peningkatan signifikan dalam perhatian terhadap AI dalam sektor pendidikan, dengan penekanan pada pembelajaran yang adaptif dan keterlibatan siswa. Meskipun penelitian ini bersifat konseptual, temuan awal memberikan wawasan yang kuat mengenai arah perkembangan riset dan pentingnya mengintegrasikan AI untuk menciptakan sistem pembelajaran daring yang lebih efektif, inklusif, dan cerdas.

Kata kunci: Kecerdasan Buatan, pembelajaran personal, pendidikan daring, sistem adaptif, teknologi Pendidikan

INTRODUCTION

Education is one of the important aspects in community development and the advancement of human civilization (Liriwati, 2023). Education has long been recognized as a fundamental pillar in the development of a nation because of its ability to shape individuals who are qualified and ready to face global challenges.

However, with the development of technology, particularly artificial intelligence (AI), the global education landscape has undergone significant changes (Rochmawati et al., 2023). Technology has driven a paradigm shift in the way we learn, teach, and manage the educational process.

The education system needs to be adapted to the times and the needs of the new generation. Today's young generation has grown up as digital natives, a generation that has been familiar with digital technologies such as computers, the internet, and smartphones since birth (Endarto & Martadi, 2022). Therefore, conventional learning methods are no longer relevant to them.

Artificial intelligence (AI) is a computer program designed to mimic human cognitive abilities, such as decision-making and logical thinking. AI can be utilized in the learning process to improve quality and help develop students' potential, including in the aspect of creativity (Anas & Zakir, 2024).

The integration of AI in education enables more personalized and adaptive learning. AI is capable of analyzing large amounts of data, detecting patterns, and providing recommendations tailored to the characteristics of individual students (Mayasari et al., 2023). This opens up opportunities to create a more effective and efficient learning experience. Artificial intelligence is also increasingly showing its potential in various sectors of life, including education (Mauluddin, 2024). In this context, AI is a strategic innovation in supporting personalized learning that tailors learning materials and approaches to the needs and abilities of each student. One of the leading innovations that is attracting increasing attention is the use of Artificial Intelligence (AI) in the learning process. AI has shown great potential in revolutionizing the way we understand, design, and run education systems. One of the main focuses in modern education is personalized learning, which is an approach that tailors the learning process to the needs, abilities, and preferences of each individual (Widodo et al., 2024). AI can support teachers' decision-making and help students achieve optimal learning outcomes.

The implementation of AI in education, especially in technology-based institutions such as Cyber University, presents both opportunities and challenges. The use of AI is expected to improve the overall quality of learning, amid technological advances that have touched almost all areas of life (Sitorus & Murti, 2024). Insan et al (2024) in their study entitled Study Literature Review of the Use of Artificial Intelligence Technology in Personalizing Online Learning states that there are several challenges, but the use of AI in personalizing online learning shows great potential in improving the quality of education to be more inclusive and adaptive. Meanwhile, according to Waruwu (2024) in his study entitled Christian Religious Education in the AI Era: Using Artificial Intelligence for Spiritual Learning Personalization, AI has transformative potential in Christian religious education, but its application must be carried out carefully to ensure that technology supports, rather than replaces, important aspects of Christian religious education, including character building and authentic spiritual growth. In line with this, Widodo et al (2024) state that AI has great potential to transform the education system into a more adaptive and personalized one. However, to maximize its positive impact, the implementation of Artificial Intelligence in education must be accompanied by careful

preparation, including policy development, teacher training, and the provision of infrastructure and equitable access. Thus, based on the description above, it is interesting to explore the potential of AI in improving the personalization of online learning.

METHOD

The research was conducted online using Publish or Perish and VOSviewer software in June 2025. This study used a simple quantitative bibliometric approach to analyze trends, keywords, and scientific influence in the field of Artificial Intelligence (AI) based on bibliographic data. The sample was taken using purposive sampling, which involved selecting 10 scientific journal articles relevant to the topic of Artificial Intelligence, published between 2020 and 2024, and available on Google Scholar. Data was collected using Publish or Perish with the keyword "Artificial Intelligence." The data obtained was analyzed using VOSviewer to map the relationships between keywords, author collaborations, and citations, and visualized in the form of a network map.

RESULT AND DISCUSSION

Data obtained through the Publish or Perish (PoP) application shows articles with the highest number of citations related to the topic of Artificial Intelligence (AI) in the field of education during the period 2020–2024. This can be seen in Table 1

Data obtained through the Publish or Perish (PoP) application shows articles with the highest number of citations related to the topic of Artificial Intelligence (AI) in the field of education during the period 2020–2024, as presented in Table 1. The article with the highest number of citations was written by FY Lirwati (2023) entitled Artificial Intelligence Curriculum Transformation for Education with 144 citations and CitesPerYear 72, indicating a significant influence in the development of AI topics in education. This is followed by DR Rochmawati and I Arya (2023) with 79 citations and CitesPerYear 39.5, and M. Sitorus and MDF Murti (2024) with 18 citations and CitesPerYear 18. These findings indicate that attention to issues of curriculum transformation and the use of AI in education has increased in the last five years. Based on bibliometric visualization, several important findings were obtained:

1. Publication Trends

The number of publications on the topic of AI has shown a significant upward trend since 2020, peaking in 2023. The increase in the number of citations and publications in the PoP table reinforces this finding. This indicates a growing interest in the application of AI in the education sector, particularly in curriculum development and technology-based learning efficiency.

2. Popular Topics

From the results of keyword analysis (co-occurrence) and word frequency in VOSviewer, frequently appearing topics include: Machine Learning, Deep Learning, AI in Education, and ChatGPT, In the context of education: adaptive learning, intelligent tutoring systems, and student engagement. This is reinforced by the VOSviewer term table, which shows that words such as "learning," "personalized," "artificial intelligence," and "artificial intelligence" dominate the research cluster. This means that AI in education is not just a temporary trend, but also a foundation for digital learning strategy planning

Table 1. Statistic Publish or Perish

Cites	Authors	Title	Year	GSRank	CitesPerYear	CitesPerAuthor
79	DR Rochmawati, I Arya...	Manfaat Kecerdasan Buatan Untuk Pendidikan	2023	1	39.50	26
18	M Sitorus, MDF Murti	Analisis pengaruh penggunaan artificial intelligence pada pembelajaran di cyber university	2024	2	18.00	9
144	FY Liriwati	Transformasi Kurikulum; Kecerdasan Buatan untuk Membangun Pendidikan yang Relevan di Masa Depan	2023	3	72.00	144
29	YB Widodo, S Sibuea, M Narji	Kecerdasan Buatan dalam Pendidikan: Meningkatkan Pembelajaran Personalisasi	2024	4	29.00	10
13	M Mauluddin	Kontribusi Artificial Intelligence (AI) pada Studi Al Quran di Era Digital; Peluang dan Tantangan	2024	5	13.00	13
78	I Anas, S Zakir	Artificial intelligence: Solusi pembelajaran era digital 5.0	2024	6	78.00	39
5	Y Waruwu	Pendidikan agama Kristen dalam era AI: menggunakan kecerdasan buatan untuk personalisasi pembelajaran spiritual	2024	7	5.00	5
38	N Mayasari, R Dewantara, Y Yuanti	Pengaruh kecerdasan buatan dan teknologi pendidikan terhadap peningkatan efektivitas proses pembelajaran mahasiswa di jawa timur	2023	8	19.00	13
150	IA Endarto, M Martadi	Analisis potensi implementasi metaverse pada media edukasi interaktif	2022	9	50.00	75
3	K Insan, A Huda, D Irfan...	Study Literature Review Penggunaan Teknologi Kecerdasan Buatan Dalam Personalisasi Pembelajaran Online	2024	10	3.00	1

Source: Compiled from Google Scholar via Publish or Perish (2025)

3. Author and Country Collaboration

The co-authorship analysis results show that author collaboration is dominated by developed countries such as the United States, China, and India. In Indonesia, collaboration between authors is still limited but is beginning to grow, especially in technology campuses. Articles with local authors such as Rochmawati and Sitorus show that the contribution of Indonesian researchers in the field of AI for education is also beginning to be seen in global literature.

To illustrate the interrelationships between keywords and the distribution of research topics visually, a VOSviewer-based network visualization map was used. The following image shows the thematic relationships between terms that frequently appear in the literature on artificial intelligence in education. Keywords that are close to each other indicate strong thematic relationships and form specific clusters, such as learning personalization, data analysis, and the use of AI in digital platforms.

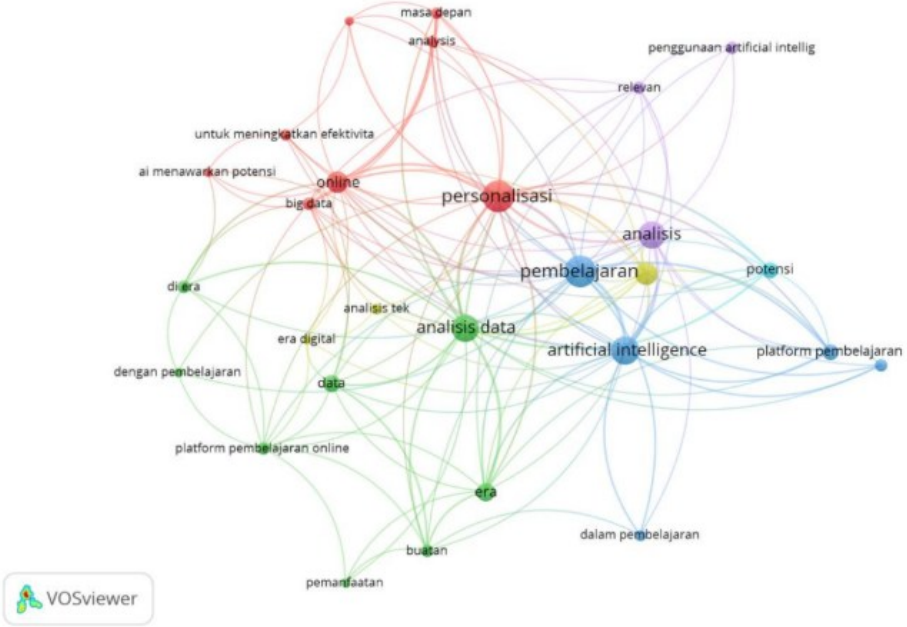
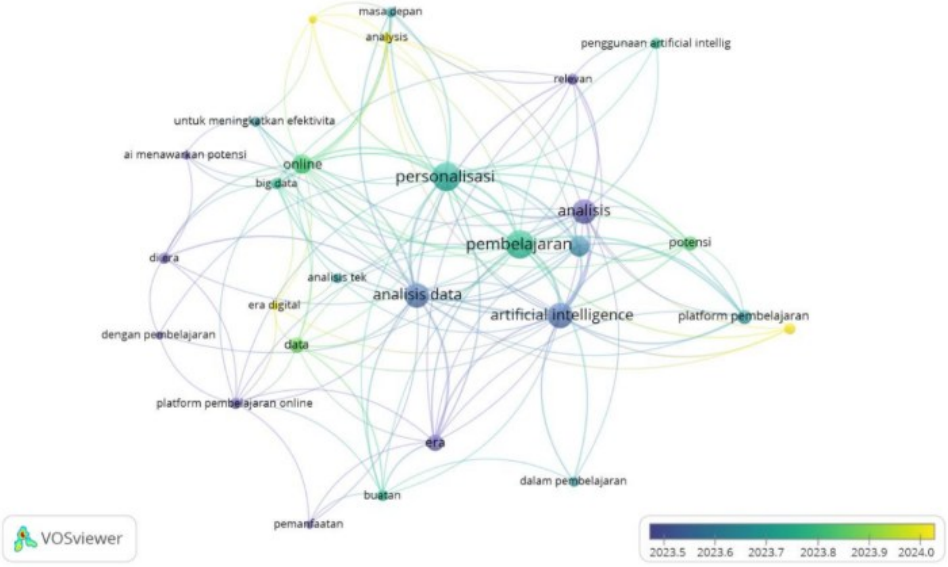


Figure 1. Network Visualization.
Source: VosViewer

The visualization results show that keywords such as learning, personalization, data analysis, and artificial intelligence form closely connected core clusters. This indicates that the main focus of the research is on the use of AI technology to improve the effectiveness and personalization of the learning process. To see the temporal dynamics of the emergence of keywords in the research, an overlay visualization was used to map the emergence of terms based on publication time. This visualization provides an overview of the development of topics over time, with a color spectrum indicating the period of keyword emergence. The more yellow the color, the more recent the term is in the literature, while blue indicates terms that have been used for a longer period of time.



Gambar 2. Overlay Visualizatio

Sumber: VosViewer

Based on overlay visualization, it can be seen that topics such as learning platforms and the use of AI are beginning to appear more frequently in recent publications, especially in 2023–2024. This indicates a shift in research interest towards the practical implementation of AI technology in digital education.

In addition to looking at correlations and developments over time, density visualization is used to show how often a keyword appears in the literature. Lighter colors (yellow) indicate the most frequently discussed terms, while darker colors indicate lower frequencies.

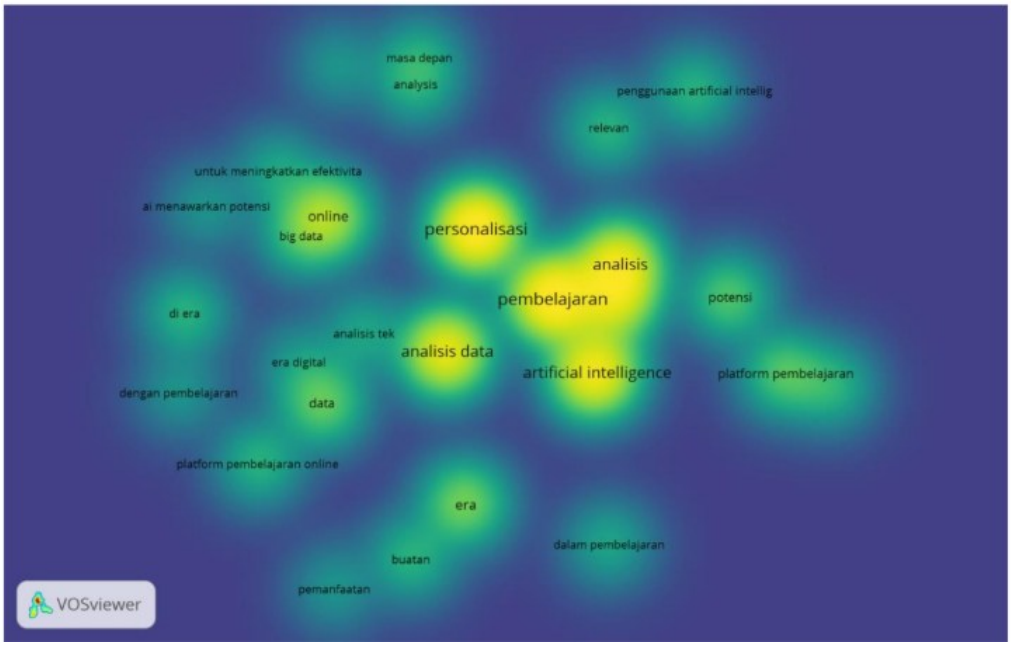


Figure 3. Density Visualization
Source: VosViewer

The density visualization shows that terms such as learning, AI, analysis, and personalization have the highest frequency of occurrence. This indicates that these topics are the focus of attention in artificial intelligence studies in the field of education.

The VOSviewer map shows strong clusters focusing on:

- AI-based learning technologies,
- Recommendation system development,
- AI-based predictive analysis for educational evaluation.

To support this visualization, the following table presents the top ten keywords that appear most frequently in the literature related to artificial intelligence in education. The frequency and relevance score displayed help identify terms that play an important role in shaping research clusters.

Table 2. Top Ten Keywords in AI and Education Literature

Term	occurrences	relevance score
pembelajaran	25	0.2869
personalisasi	25	0.1729
artificial intelligence	20	0.4629
analisis	18	0.4928
analisis data	18	0.331
kecerdasan buatan	13	0.3731
online	11	0.5772
era	8	0.507
data	7	0.9541
platform pembelajaran	6	0.5821

Source: Vosviewer

The table shows that terms such as learning, personalization, artificial intelligence, and data analysis are dominant keywords with a high number of occurrences. This reinforces previous findings that research focus is largely directed at the use of AI technology to support effectiveness and personalization in the learning process.

▪ CONCLUSION

Based on a bibliometric analysis of works published between 2020 and 2024, it appears that the implementation of Artificial Intelligence (AI) in the education sector has increased significantly, especially in supporting the personalization of online learning. Recent research shows that AI technologies, such as machine learning and adaptive systems, can improve the effectiveness and efficiency of the learning process by tailoring materials and methods to the needs of each student.

Findings also show that issues such as personalization, data analysis, and AI in education are major concerns in academic publications. Research collaboration is still dominated by developed countries, although contributions from Indonesian researchers are beginning to show positive progress. Visualization through VOSviewer clarifies the existence of groups that emphasize the integration of AI technology in digital learning platforms.

Therefore, stronger support is needed in terms of policy, training for educators, and digital infrastructure so that the potential of AI in education can be maximized. This research provides an important basis for further research and strategic planning in the

development of online learning systems that are more personalized, adaptive, and sustainable.

▪ REFERENCES

Anas, I., & Zakir, S. (2024). Artificial intelligence: Solusi pembelajaran era digital 5.0. J- SAKTI (Jurnal Sains Komputer dan Informatika), 8(1), 35-46.

Endarto, I. A., & Martadi, M. (2022). Analisis potensi implementasi metaverse pada media edukasi interaktif. BARIK-Jurnal S1 Desain Komunikasi Visual, 4(1), 37-51

Insan, K., Huda, A., Irfan, D., & Hendriyani, Y. (2024). Study Literature Review Penggunaan Teknologi Kecerdasan Buatan Dalam Personalisasi Pembelajaran Online. Jurnal Teknik Komputer Dan Informatika, 4(3| Desember), 1-7.

Liriwati, F. Y. (2023). Transformasi Kurikulum; Kecerdasan Buatan untuk Membangun Pendidikan yang Relevan di Masa Depan. IHSAN: Jurnal Pendidikan Islam, 1(2), 62-71.

Mauluddin, M. (2024). Kontribusi Artificial Intelligence (AI) pada Studi Al Quran di Era Digital; Peluang dan Tantangan. Madinah: Jurnal Studi Islam, 11(1), 99-113.

Mayasari, N., Dewantara, R., & Yuanti, Y. (2023). Pengaruh kecerdasan buatan dan teknologi pendidikan terhadap peningkatan efektivitas proses pembelajaran mahasiswa di jawa timur. Jurnal Pendidikan West Science, 1(12), 851-858.

Rochmawati, D. R., Arya, I., & Zakariyya, A. (2023). Manfaat Kecerdasan Buatan Untuk Pendidikan. Jurnal Teknologi Komputer Dan Informatika, 2(1), 124-134.

Sitorus, M., & Murti, M. D. F. (2024). Analisis pengaruh penggunaan artificial intelligence pada pembelajaran di cyber university. Innotech: Jurnal Ilmu Komputer, Sistem Informasi dan Teknologi Informasi, 1(2), 90-101.

Waruwu, Y. (2024). Pendidikan agama Kristen dalam era AI: menggunakan kecerdasan buatan untuk personalisasi pembelajaran spiritual. Jurnal Abdiel: Khazanah Pemikiran Teologi, Pendidikan Agama Kristen dan Musik Gereja, 8(2), 151-165.

Widodo, Y. B., Sibuea, S., & Narji, M. (2024). Kecerdasan Buatan dalam Pendidikan: Meningkatkan Pembelajaran Personalisasi. Jurnal Teknologi Informatika dan Komputer, 10(2), 602-615.