ChatGPT in Aviation Education; A Bibliometric Mapping Visualized with Vosviewer

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Article Info	Abstract
	Since being released in November 2022, ChatGPT, a popular artificial-intelligence chatbot, has gained attention in almost all industry. It has been also rapidly evolving in education due to the rise of internet-based learning. This research aims to present a bibliometric mapping of ChatGPT in aviation education using mapping analysis with VOSviewer software. The research data was obtained using the Publish or Perish reference manager and was based on the keyword "ChatGPT in Aviation Education." A total of 998 relevant articles which were indexed between 2017 and 2023 were found. The results indicate that the number of articles on ChatGPT in aviation education has been increasing since 2017 and 898 articles were published in 2023. This research is intended to provide a reference for researchers in selecting research themes related to ChatGPT in aviation education. From six clusters found, it visualized that numerous studies have already examined the relationship between ChatGPT and study, while the relationship between ChatGPT and flight has been less frequently analyzed. The relationship of those two items could be potential theme for advanced research.
Artikel Info	Abstrak
	Sejak diluncurkan pada November 2022, aplikasi kecerdasan buatan ChatGPT telah mendapatkan perhatian di hampir semua bidang. Di bidang pendidikan, chatbot ini juga berpengaruh pesat karena semaking berkembangnya pembelajaran berbasis internet. Dari potensi ini, penelitian ini dilakukan untuk menyajikan pemetaan bibliometrik ChatGPT dalam pendidikan penerbangan menggunakan software analisis pemetaan VOSviewer. Data penelitian diperoleh dengan menggunakan pengelola referensi Publish or Perish dengan kata kunci "ChatGPT dalam Pendidikan Penerbangan". Secara umum, program ini menemukan 998 relevan artikel yang diindeks antara tahun 2017 hingga 2023. Hasil penelitian menunjukkan bahwa jumlah artikel tentang ChatGPT dalam pendidikan penerbangan mengalami peningkatan sejak tahun 2017, dan sebanyak 898 artikel diterbitkan sepanjang tahun 2023. Penelitian ini dimaksudkan untuk memberikan acuan bagi peneliti dalam memilih tema penelitian terkait ChatGPT dalam pendidikan penerbangan. Dari enam cluster yang ditemukan, terlihat bahwa banyak penelitian telah meneliti hubungan antara ChatGPT dan studi, sedangkan hubungan antara ChatGPT dan penerbangan masih sangat jarang dianalisis. Hubungan kedua hal tersebut dapat menjadi tema potensial untuk penelitian selanjutnya.

I. INTRODUCTION

The artificial-intelligence industry has been rapidly evolving since November 2022 when the ChatGPT was launched to public for the first time (Jürgen Rudolph, Tan and Tan, 2023). This popular 'chatbot' has recently gained attention due to the rise of the internet-based education (Kasneci *et al.*, 2023).

ChatGPT is an AI tool created by OpenAI that generates text based on user prompts. It is designed to comprehend natural language and provide intelligent and relevant answers to user questions. Although it has been trained on a large amount of data, its knowledge is limited to events that occurred before 2021 (OpenAI, 2022).

This technology can transform many educational activities such as information retrieval, answering questions, engaging in discussions, writing and editing reports, coding, tutoring, providing data samples for analysis, solving mathematical and statistical problems and translating texts. However, there are concerns about its use in education due to its AI-based nature. These include potential bias and discrimination, privacy issues, job loss, lack of creativity and critical thinking, inaccuracies and plagiarism (Atlas, 2023; D'Amico *et al.*, 2023; Dubin *et al.*, 2023; Halaweh, 2023; Mhlanga, 2023).

There are concerns about the use and application of new technology, particularly when

it is used to evaluate knowledge or skills (Halaweh, 2023). Many researchers have studied the use of ChatGPT in education. These studies include research on its potential role in clinical radiology (Ismail, Ghorashi and Javan, 2023), its use for automated essay scoring (Mizumoto and Eguchi, 2023), its ability to support complex problem-solving (Joksimovic *et al.*, 2023), its use in pathology (Nakagawa *et al.*, 2023), and its use in nursing education (O'Connor, 2023). Despite many studies on Chat GPT in education, there is still a lack of bibliometric analysis on its use in aviation education, particularly using VOSviewer software for mapping analysis. This analysis is important for understanding the quantity and current status of a term.

There is a potential study of ChatGPT in aviation education. Artificial intelligence employed a cutting-edge technology to boost the efficiency of constructing aviation systems throughout their entire lifecycle, thereby increasing their security and enhancing their ability to learn, adapt and anticipate challenging scenarios (Shmelova, Sterenharz and Dolgikh, 2020). Artificial intelligence systems and technologies have the potential to significantly enhance the security domain within the aviation industry by providing solutions such as anomaly detection for avionics, secure data link communications, and security certification, among other benefits (Garcia, Babiceanu and Seker, 2021).

Bibliometric maps are particularly useful for researchers dealing with a large body of literature. They allow the researcher to not only identify individual elements such as keywords, but also to understand the relationships between them (Garcia Carreño, 2020).

In this era of rapid technological growth, visual analysis of bibliometric data using mapping tools is essential (Husaeni and Nandiyanto 2022). These tools provide descriptions and information on the development of scientific fields and research performance. VOSViewer is an example of a mapping tool that can be used for bibliometric data analysis (Garcia Carreño, 2020).

VOSviewer is a software tool for creating, visualizing and exploring maps based on network data. Although primarily intended for analyzing bibliometric networks, it can be used with any type of network data (van Eck and Waltman, 2017). Bibliography refers to a list of books or articles on a specific topic or subject. VOSviewer is commonly used to explore references on widely used topics to identify potential areas for further research (Husaeni and Nandiyanto, 2022).

Hence, this study aims to conduct a bibliometric analysis of ChatGPT in Aviation Education using mapping analysis with VOSviewer software. The research is intended to serve as a reference for researchers in selecting and determining research topics related to ChatGPT in Aviation Education.

II. METHOD

Bibliometrics involves the use of statistical methods to analyze books, articles and other publications. Bibliometric mapping is a powerful tool for studying the structure and dynamics of scientific fields (Noyons, 2005; van Eck *et al.*, 2010)). Co-authorship and co-occurrence of keywords in scientific articles on ChatGPT in aviation education were used to identify trends and research goals (Garcia Carreño, 2020).
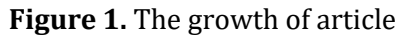
The data used in this study comes from articles published in journals indexed by Googlescholar. The reference manager application Publish or Perish was used to obtain the data and conduct a literature review on the chosen theme. Articles indexed by Googlescholar in the form of journal articles and relevant to the study's theme were backed up into a file for use with VOSviewer.

In this study, articles were filtered to include only those related to ChatGPT in Aviation Education. Data was searched on Publish or Perish using the keyword "ChatGPT in Aviation Education" in the title, keyword and abstract criteria. The articles indexed were published in the last five years. The result were then selected and saved in reference manager (*.ris) format. This data were then genereated by the VOSviewer application to visualize and analyze trends as bibliometric maps. Data mapping was performed on the prepared database sources using network, density and overlay visualization. Terms were also filtered for inclusion in the VOSviewer network mapping visualization.

III. RESULTS AND DISCUSSION
A. Results

A total of 998 articles indexed from 2017 until 2023 that has correlation with ChatGPT in Aviation Education were collected by Publish or Perish. From the visualization generated by Vosviewer, this study found that the correlation between ChatGPT and flight was adjacent but it has been less frequently discussed.

Figure 1. The growth of article

Figure 1 represents the growth of studies on ChatGPT in Aviation Education from 2017 to 2023. Based on chart, the growth of studies on ChatGPT in Aviation Education from 2017-2022 has been fluctuating. The number of articles in 2017 was 4 articles, where in 2018, the number of articles decreased to 2. The number of article in 2019 decreased to 0 points and continue to increase to 6 articles in 2020. In 2021, the number of article increased to 7 but increase again in 2022 to 11 articles. There have been escalation of 898 articles that published in 2023.

B. Discussion

1. Topic Area Visualization of ChatGPT in Aviation Education

In VOSviewer, the minimum number of relationships between terms is set to 2 (Husaeni and Nandiyanto 2022). According to the mapping visualization on figure 2, research related to ChatGPT in Aviation Education is classified into 6 clusters.

Cluster 1 consists of 21 items: bot, case, chat gpt, chat bot, chatgpt, context, covid, example, gpt, large language model, llm, model, openai, performance, poem, question, story, study, topic, twitter, and way.

Cluster 2 consists of 16 items: aircraft, capability, current study, dall e, field, flight, future, generative ai, generative artificial intelligence, help, machine, person, scenario, student, training, and work.

Cluster 3 consists of 14 items: aviation, business, challenge, education, healthcare, impact, implication, industry, opportunity, overview, perspective, research, society, and technology.

Cluster 4 consists of 13 items: application, article, artificial intelligence, case study, era, higher education, journal, openais chatgpt, system, task, time tool, and use.

Cluster 5 consists of 9 items: ability, aircraft carrier, answer, human, large language models, paper, response, text, and user.

Cluster 6 consists of 8 items: academic assignment, ai text generator chatgpt, chatgpts, development, ethics, last year, order, and plagiarism software.

The clusters which are visualized in figure 2 are signed with different colors. Cluster 1 is signed in red, cluster 2 is signed in green, cluster 3 is signed in dark blue, cluster 4 is signed in yellow, cluster 5 is signed in purple, and cluster 6 is signed in light blue.

Figure 2. Visualization of ChatGPT in Aviation Education

The closer network between items means that there are more occurrence of publication. On the contrary, the further network between items means there are fewer occurrence of publication.

2. Keyword and Title Network Visualization of ChatGPT in Aviation Education

In network visualization, the relationships between terms are displayed as a network. Items are represented by their label and a circle, with the size of both determined by the item's weight (Husaeni and Nandiyanto 2022). Figure 2 shows the relationships between terms as lines connecting them. It also shows clusters in each researched topic area. ChatGPT is included in cluster 1 with a total strength of 530 and occurrence of 153.

Figure 3. Overlay Visualization

Figure 3 displays the Overlay Visualization which shows the frequency of keyword usage or research by year. According to Figure 8, the keyword "ChatGPT" was most frequently researched in 2023.

Visualization shows that abundant studies have already examined ChatGPT in the relationship with the term study. For example, (Gašević, Siemens and Sadiq, 2023) identified the effective learning and teaching practices with the use of AI. Rudolph, Tan, and Tan (2023) also analyzed student assessment in higher education.

In the meantime, the correlation between ChatGPT and flight has been less frequently analyzed. One of the research is from Stall et al. (2023) who examined the AI/ML Ethics principles in the Earth, environmental, and space sciences. Hence, the adjacent relationship of those latter items could be potential theme for advanced research.

IV. CONCLUSION AND SUGGESTION
A. Conclusions

This project aims to conduct bibliometric research on ChatGPT in Aviation Education using mapping analysis with VOSviewer software. The reference manager tool PoP version 8 was used to collect data, which was filtered using the phrase "ChatGPT in Aviation Education" in topics, titles, keywords and abstracts. A total of 998 relevant articles published between 2017 and 2021 were indexed. According to the study, the number of research fluctuated from 2017 to 2022, but it increased rapidly in 2023. A search for the term "ChatGPT in Aviation Education" yielded six clusters, each with a different number of entries and color scheme. Numerous studies had examined ChatGPT in the relationship with the term study, while limited research discussed ChatGPT in correlation with the term flight. Hence, studying ChatGPT in correlation with the term flight could be novelty in the future research.

B. Suggestion

There has been relatively little discussion of this topic. The time frame to measure the occurrence of the topic is better to be frequent. The use ChatGPT or artificial intelligence in flight is something that future writers should research more thoroughly.

REFERENCES

Atlas, S. (2023) 'Chatgpt For Higher Education And Professional Development: A Guide To Conversational AI'.

D'amico, R.S. *Et Al.* (2023) 'I Asked A Chatgpt To Write An Editorial About How We Can Incorporate Chatbots Into Neurosurgical Research And Patient Care...', *Neurosurgery*, 92(4). Available At: Https://Journals.Lww.Com/Neurosurgery/ Fulltext/2023/04000/I_Asked_A_Chatgpt_ To_Write_An_Editorial_About_How.2.Aspx.

Dubin, J.A. *Et Al.* (2023) 'Using A Google Web Search Analysis To Assess The Utility Of Chatgpt In Total Joint Arthroplasty', *The Journal Of Arthroplasty* [Preprint]. Doi:Https://Doi.Org/10.1016/J.Arth.2023. 04.007.

Garcia, A.B., Babiceanu, R.F. And Seker, R. (2021) 'Artificial Intelligence And Machine Learning Approaches For Aviation Cybersecurity: An Overview', In *2021 Integrated Communications Navigation And Surveillance Conference (Icns)*, Pp. 1–8. Doi:10.1109/Icns52807.2021.9441594.

Garcia Carreño, I. Del V. (2020) 'E-Leadership: A Bibliometric Analysis', *International Journal Of Advanced Corporate Learning (Ijac)*, 13(1 Se-Papers), Pp. 19–34. Doi:10.3991/Ijac.V13i1.12341.

Gašević, D., Siemens, G. And Sadiq, S. (2023) 'Empowering Learners For The Age Of Artificial Intelligence', *Computers And Education: Artificial Intelligence*, P. 100130. Doi:Https://Doi.Org/10.1016/J.Caeai.2023. 100130.

Halaweh, M. (2023) 'Chatgpt In Education: Strategies For Responsible Implementation', *Contemporary Educational Technology*, 15(2).

Husaeni, A. And Nandiyanto, D.F. (2022) 'Bibliometric Using Vosviewer With Publish Or Perish (Using Google Scholar Data): From Step-By-Step Processing For Users To The Practical Examples In The Analysis Of Digital Learning Articles In Pre And Post Covid-19 Pandemic', *Asean Journal Of Science And Engineering*, 2(1), Pp. 19–46.