


# Determinants of the adoption of AI technology ChatGPT in economics learning: A bibliometric analysis



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**Abstract** The integration of artificial intelligence (AI) technologies such as ChatGPT into higher education faces complex challenges, including innovation gaps, risks of academic integrity violations, and institutional preparedness to respond to digital dynamics. The urgency of achieving quality, inclusive, and sustainable education necessitates the systematic exploration of research trends and best practices to optimize the benefits of AI while mitigating its risks. This study employs a bibliometric method, analyzing 192 Scopus-indexed articles (2023–2024) via the Biblioshiny tool to map research productivity, collaboration networks, and dominant themes. The findings indicate a rapid annual growth rate of 125.42% in publications, reflecting the accelerating scholarly interest in generative AI within academia. The results reveal the dominance of contributions from the United States, China, and Australia, which collectively shape the discourse on AI-driven pedagogical transformation, while ethical concerns such as plagiarism, algorithmic bias, and equity in access emerge as persistent barriers. The analysis further identifies three prominent thematic clusters: pedagogical innovation, ethical and institutional challenges, and technological adaptation. This study contributes to a comprehensive mapping of the ChatGPT research landscape in higher education, pinpoints critical literature gaps—particularly in educator preparedness and contextualized adoption strategies—and offers evidence-based policy recommendations. These include fostering international cooperation, developing robust ethical guidelines, and enhancing AI literacy among faculty to ensure sustainable, equitable, and pedagogically sound integration of AI technologies in higher education worldwide.

**Keywords:** higher education, integration, students' ability, future learning

## 1. Introduction

The presence of ChatGPT in the higher education ecosystem has brought deep disruption, changing the way students and teachers interact with knowledge (Almahasees et al., 2024; Ekundayo et al., 2024; Sevnarayan, 2024; Soto et al., 2024). This technology not only accelerates the completion of academic tasks but also opens the door for more personalized and inclusive learning (Hakim et al., 2015, 2018; Kurniawan et al., 2019, 2025; Surjanti et al., 2022, 2024). In the United States, (Kerem, 2025; Naznin et al., 2025). Universities such as MIT have integrated ChatGPT to design adaptive curricula, while in India, the tool has become a solution for students in remote areas to access quality materials (Kambam et al., 2025; Veza et al., 2024; Zakarneh et al., 2025). However, this widespread adoption has also sparked dilemmas: A survey in Australia (2023) revealed that 68% of instructors are concerned that ChatGPT reduces students' ability to think independently, whereas AI-based plagiarism cases in the UK have increased by 40% within a year (Badge et al., 2007; Bermingham et al., 2010; Saliba & Rotzinger, 2025). This polarization underscores that ChatGPT is not merely a supportive tool but also a force reconfiguring traditional academic hierarchies (Hassan, 2023; Ravšelj et al., 2025; Shoufan, 2023).

According to empirical research conducted by Indonesian researchers, recent developments in artificial intelligence (AI) offer revolutionary possibilities for economics education. AI-enhanced tools, such as adaptive learning systems, can enable educators to design dynamic, data-driven learning environments (Nuryana et al., 2024; Sugeng & Suryani, 2024; Suryani & Sugeng, 2019). Wibowo et al. (2024) show how AI-driven market analysis and automated financial modeling, which they used in their study on SME innovation, can help entrepreneurs who lack digital literacy by offering useful applications for economics courses. Additionally, Sultoni et al. (Sultoni et al., 2022) emphasize the importance of digital transformation for the success of organizations, suggesting that simulations driven by AI (such as macroeconomic forecasting models) can improve students' readiness for actual economic difficulties. Taken together, these studies highlight AI's dual function as a pedagogical facilitator and a strategic tool for advancing economic competencies in the digital era (Maula et al., 2023).



A bibliometric analysis of over 192 publications (2023–2024) revealed three dominant thematic clusters: pedagogical innovations (e.g., virtual tutors, automated assessments), ethical risks (e.g., plagiarism, algorithmic bias), and institutional adaptation (e.g., AI policies, faculty training) (Ekundayo et al., 2024). Countries such as the US, China, and the UK dominate 73% of the literature, whereas participation from the Global South (e.g., Indonesia, Nigeria) only reaches 12%, reflecting infrastructure and research capacity gaps. Notable findings include cross-disciplinary collaborations between computer science and education, which have increased by 55% since 2022. However, only 8% of studies address faculty AI literacy, indicating a critical gap in educators' readiness for the generative AI era.

To ensure that ChatGPT functions as a partner—not a threat—universities must design clear ethical frameworks, such as transparent writing guidelines and curriculum modules on "AI critical thinking" (Rios et al., 2025). At the global level, collaboration between advanced and developing countries—such as Germany and Indonesia's AI for education programs—can reduce adoption disparities. The future of higher education will hinge on institutions' ability to balance innovation with integrity, positioning ChatGPT as a catalyst for creating graduates who are not only tech-savvy but also critical, adaptive, and ethical (Ekundayo et al., 2024; Sucena et al., 2024).

## 2. Materials and Methods

### 2.1. Data and methods

This study uses a bibliometric approach to explore and map trends in ChatGPT-related research within higher education. Research trends refer to the collective shift in focus that researchers take toward particular topics (Ekundayo et al., 2024; Sucena et al., 2024), reflecting the evolving concerns and needs of global communities through scientific investigation. Bibliometric mapping is a technique used to analyze and identify these trends. By applying bibliometric methods, researchers can uncover relevant research directions (Tomé, 2024). Access to bibliographic databases is crucial for discovering scientific publications, such as articles, authors, abstracts, and references. Scopus, a well-regarded bibliographic database, provides access to a wide range of scholarly works, including journals, conference proceedings, and books that meet international standards. It is known for indexing only high-quality academic literature and data.

### 2.2. Article selection process

The bibliographic data search process was conducted in the Scopus database on December 4, 2024. The search strategy was applied to the article title, abstract, and keywords fields via the search string "ChatGPT" AND "Higher Education" to ensure a focused search. The initial search, which was limited to the publication period from 2023–2024, yielded 1,107 documents. Next, sequential exclusion criteria were applied to refine the dataset. These criteria included selecting only peer-reviewed "Article" type documents, limiting the language to English documents, and applying an "open access" filter to ensure full-text availability.

Final refinement was performed through manual screening of the titles and abstracts of the remaining 334 records. Documents were excluded if their primary focus was not on the pedagogical, ethical, or institutional implications of the ChatGPT or GPT model in the context of higher education, such as papers on purely technical AI development. This rigorous screening process resulted in a final corpus of 192 articles deemed relevant for analysis. This is shown in Figure 1 below.

### 2.3. Data analysis

Metadata from 192 final articles were exported from Scopus in CSV format for analysis via the R Bibliometrix package (version 4.1) and the Biblioshiny web interface. These data contain information such as author names, affiliations, titles, countries, journal names, and keywords. This software provides various features for in-depth bibliographic analysis of scientific publications, including metrics on publication numbers, citations, co-occurrence networks, and keywords, as well as standardized and reliable bibliometric measurements.

Quantitative descriptive analysis was applied to extract key insights from research on ChatGPT in higher education. Biblioshiny's built-in functions are used to calculate key data sets, including annual growth rates, average citations per document, and author collaboration indices such as the number of coauthors per document and the percentage of international collaborations. This analysis provides details on the most productive titles, journals or sources, leading countries in publication, and top affiliated institutions. Citation patterns between authors were also explored through coauthorship analysis (Al Faruq et al., 2023; Bhullar et al., 2024).

To map the conceptual structure of this field, a co-occurrence network analysis of keywords was conducted by selecting the "Author Keywords" field. In Biblioshiny, a minimum occurrence of five was set for a keyword to filter out terms that were too rare and focus attention on core themes. The network was constructed via the association strength normalization method, whereas the walktrap algorithm was applied for clustering to identify different thematic groups. The resulting network was analyzed via standard metrics such as centrality measures to identify the most influential keywords and density to examine cohesion within clusters. On the basis of this network, a thematic map was generated to categorize research themes on the basis of centrality and density, which helped identify niche, emerging, foundational, and driving themes in the literature.

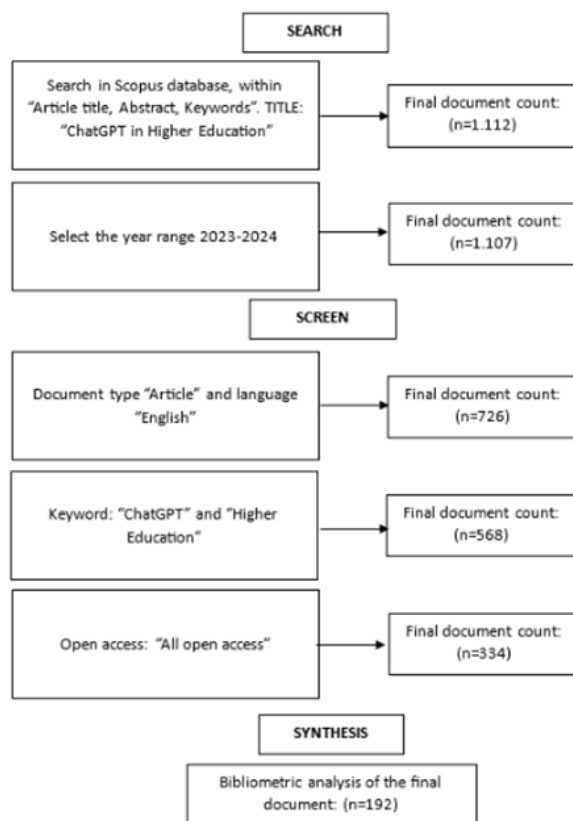


Figure 1 Article Selection Flowchart. Source: Data processed by the authors from the Scopus database (2025).

### 3. Results

#### 3.1. Main information and publication trends

This study in table 1 shows the period 2023--2024 or within a period in a year since this study was conducted, with annual growth increasing by up to 125,42%. Furthermore, the number of article documents analyzed in this study was 192. Moreover, 714 researchers were involved in this research, with a total of 192 articles. The average number of citations per document is 25,12. Meanwhile, the annual research trends as shown in Figure 2 are illustrating significantly increase during 1 year.

The trend of research articles focusing on artificial intelligence and its impact on higher education significantly increased from 2023-2024. A sharp increase was observed in 2023, which persisted until 2024. This increase indicates a growing acknowledgment of the potential of AI, particularly ChatGPT, in transforming educational methods and promoting the attainment of Sustainable Development Goal (SDG) 4, which is aimed at ensuring inclusive and high-quality education for everyone (AISagri & Sohail, 2024; Santamaría-Velasco et al., 2025).

In earlier years, the study of education technology has varied, often swayed by changes in curricula and shifts in policies (Ololube, 2015; Vanderlinde et al., 2009). However, the influx of publications during 2023 and 2024 signals a revived eagerness toward the transformative role of AI tools such as ChatGPT in education, enhancing accessibility, personalization, and efficiency in learning. This growth period highlights a deeper appreciation for AI in addressing global educational challenges.

This increasing trend highlights the necessity of further investigation into AI's role in education, especially with respect to enhancing learning results, encouraging critical thinking, and ensuring fair access to high-quality education (Bharathyvaraj & Masilamani, 2024). The surge in articles within this brief period strongly signals AI's rising importance as an instrument for advancing global education, aligned with SDG 4 (AISagri & Sohail, 2024; Álvarez et al., 2023; Nedungadi et al., 2024).

#### 3.2. Most productive authors

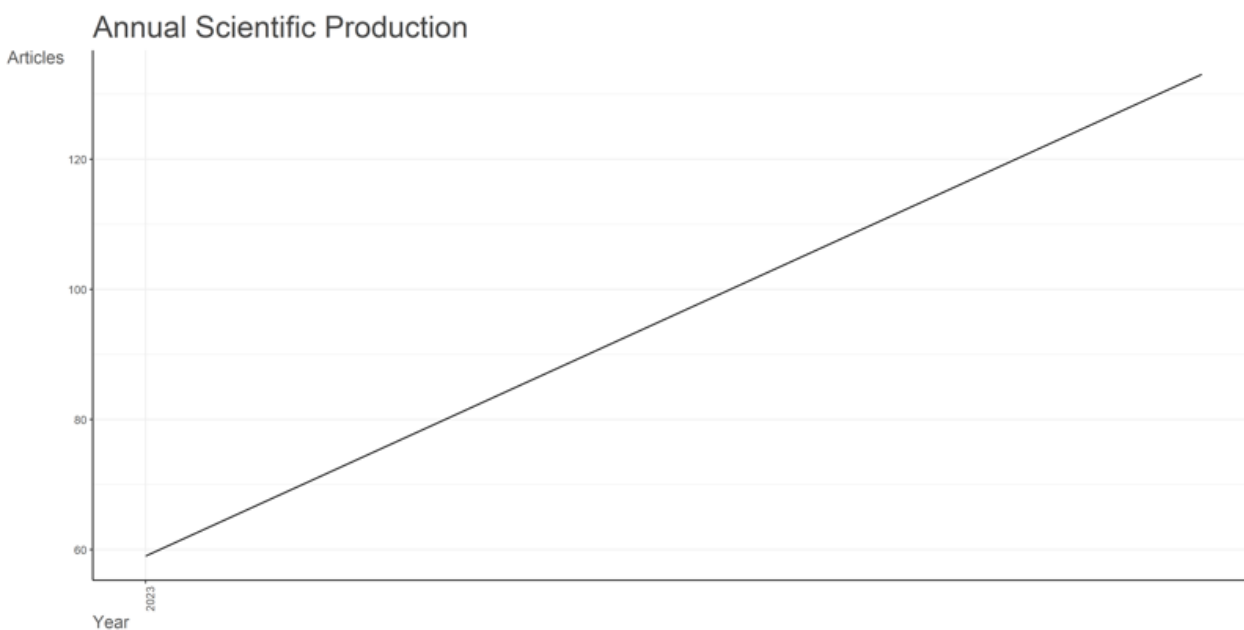
Figure 3, which shows the number of publications produced by each author, clearly shows that some authors demonstrate consistency in researching ChatGPT and its application in higher education. As noted, Cowling M exhibits high consistency, having produced work throughout the period from 2023-2024. In the second position is Tan S, which has the highest number of articles compared with other researchers. Additionally, Allen K.A., Crawford, and Chen J share the same level of consistency as Cowling M in producing research related to the ChatGPT and its implementation in higher education.



**Table 1** Main Information.

| Description                     | Results   |
|---------------------------------|-----------|
| Main Information About Data     |           |
| Timespan                        | 2023:2024 |
| Sources (Journals, Books, Etc)  | 106       |
| Documents                       | 192       |
| Annual Growth Rate %            | 125.42%   |
| Document Average Age            | 0.307     |
| Average Citations Per Doc       | 25.12     |
| References                      | 9144      |
| Document Contents               |           |
| Keywords Plus (Id)              | 365       |
| Author's Keywords (De)          | 559       |
| Authors                         |           |
| Authors                         | 714       |
| Authors Of Single-Authored Docs | 25        |
| Authors Collaboration           |           |
| Single-Authored Docs            | 25        |
| Co-Authors Per Doc              | 4.01      |
| International Co-Authorships %  | 31.25     |
| Document Types                  |           |
| Article                         | 192       |

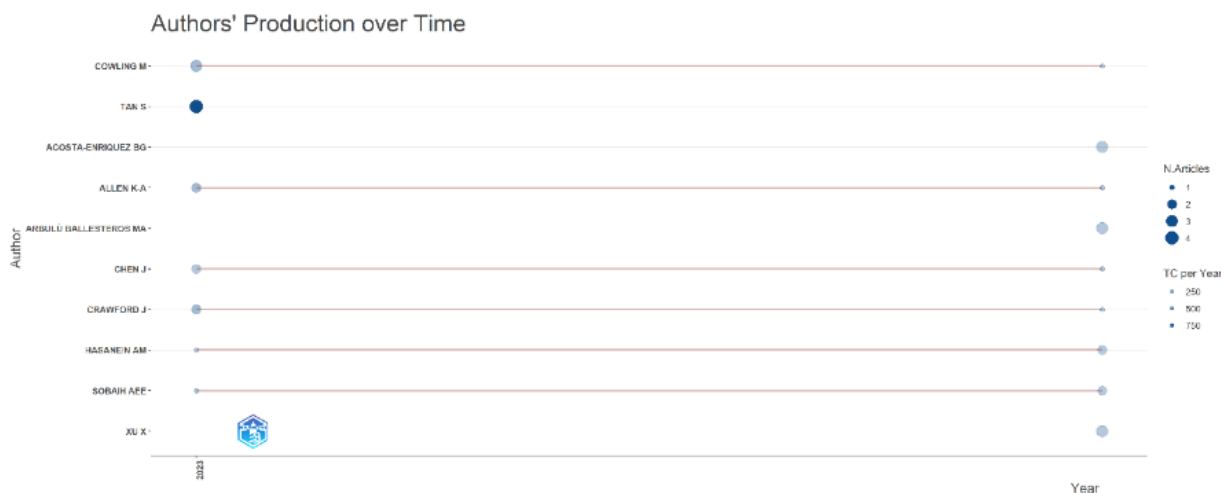
Source: Data processed by the authors from the Scopus database (2025).



**Figure 2** Annual research trends. Source: Data processed by the authors from the Scopus database (2025).

One of Cowling M's studies is titled "Using leadership to leverage ChatGPT and artificial intelligence for undergraduate and postgraduate research supervision." This research revealed that ChatGPT can be used to increase the quality of academic research. Furthermore, ChatGPT can also serve as a tool to address the psychological needs of students (Cowling et al., 2023). In Crawford's research, titled "When artificial intelligence substitutes humans in higher education: the cost of loneliness, student success, and retention," it is highlighted that while AI offers easy access to information, its use in replacing human interaction risks harming students' sociopsychological well-being and ultimately reduces their academic success. The emphasis on holistic education rather than focusing solely on technical artificial intelligence is a key highlight of this research, as the impact of this emphasis on social aspects (Crawford et al., 2024).





**Figure 3** Top Author Production. *Source:* Data processed by the authors from the Scopus database (2025).

While the top author could be described as in Table 2, which also has detailed information about the articles they published, article fractionalized, h-index, and also their total citation in all of their articles. Specifically, in Table 2, the leading author is Cowling M, with a total of 4 articles published. The H-index is 4, which is the highest among the other authors. Cowling M's total citations amount to 248. Cowling M's research typically focuses on educational technology, computer science education, digital competence, and mixed reality. This positions Cowling M as an author who has made significant contributions to the research areas of educational technology, computer science education, digital competence, and mixed reality. With the highest number of publications, H-index, and total citations compared with other authors, Cowling M demonstrates a significant impact in this field and serves as a primary reference for other researchers interested in similar issues. This success reflects the efficiency and relevance of the research conducted in supporting the growth of educational technology and related fields.

**Table 2** Top Author.

| Authors            | Articles | Articles Fractionalized | h-index | Total Citation |
|--------------------|----------|-------------------------|---------|----------------|
| Cowling M          | 4        | 1.08                    | 4       | 248            |
| Tan S              | 4        | 1.33                    | 4       | 1836           |
| Acosta-Enriquez Bg | 3        | 0.50                    | 2       | 15             |

*Source:* Data processed by the authors from the Scopus database (2025).

In the second position is Tan S, who has published 4 articles related to ChatGPT in higher education. The H-index is 4, and with 1,836 citations, Tan S is the author with the highest number of citations among the other authors. The third position is Acosta-Enriquez Bg, who has published 3 articles related to ChatGPT in higher education. The number of citations for Acosta-Enriquez Bg is 15, making them the author with the lowest number of citations compared with other researchers. Acosta-Enriquez Bg's recent research titled "Exploring attitudes toward ChatGPT among college students: An empirical analysis of cognitive, affective, and behavioral components using path analysis," which discusses how students' views on ChatGPT are shaped through Mitcham's framework, indicating that both cognitive and emotional aspects significantly influence their behavioral attitudes. This also highlights that factors such as gender or age do not play a significant moderating role, providing valuable insights for integrating generative AI into higher education (Acosta-Enriquez et al., 2024).

### 3.3. Most productive sources

The top sources that authors published in these sources are as illustrated in Table 3, which show the top sources producing articles in ChatGPT in Education keywords. Moreover, cite score, H-index, G-index, M-index, total citations of each article are also shown in Table 3. For instance, three leading journals contribute to research on the integration of artificial intelligence (AI), particularly ChatGPT, in higher education. The Journal of Applied Learning and Teaching records the highest performance, with a Cite score of 9.0 and an H-Index of 10, indicating significant academic impact through productivity (N=12 articles) and citation quality (TC=1630). The high M-Index of 5.000 reflects a sustained impact since 2023, aligning with ChatGPT as a recent innovation. Computers and Education: Artificial intelligence focuses specifically on AI in education, with a highly competitive Cite score of 16.8 but fewer publications (N=11). An H-Index of 6 and a G-Index of 11 suggest that while productivity is limited, key works (TC=271) have garnered widespread attention, reinforcing its position as a primary reference for AI-based educational research.



**Table 3** Top sources.

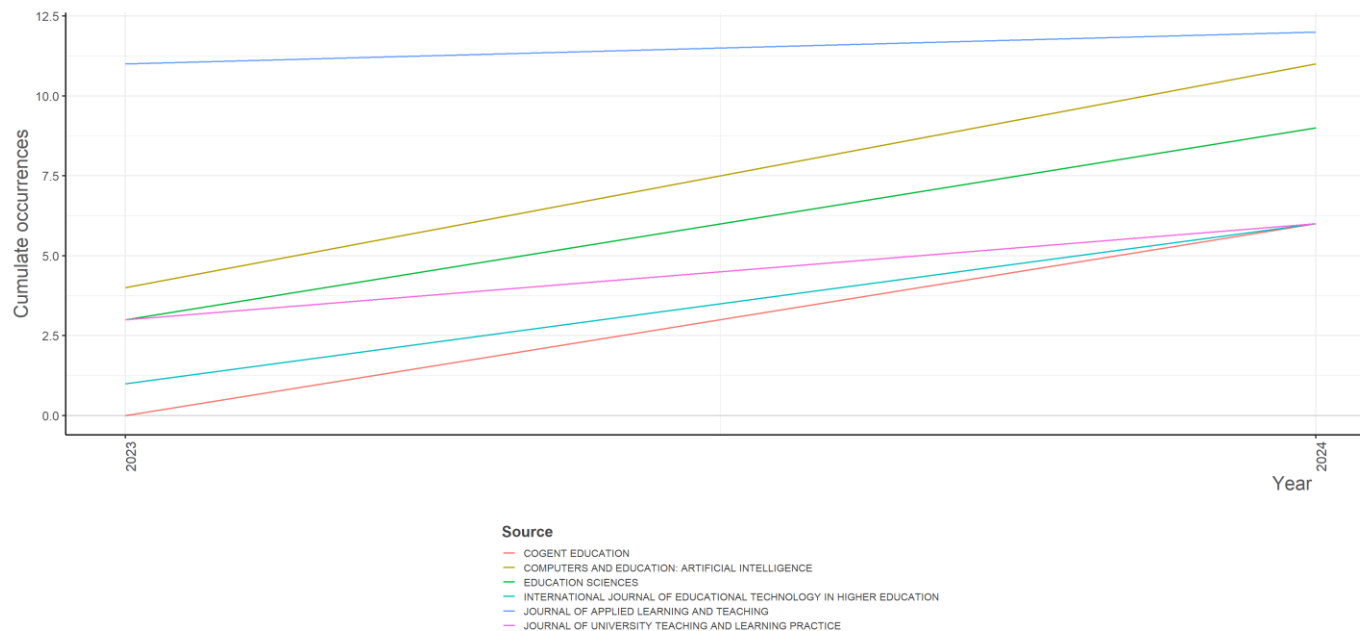
| Source Name   | N  | Cite Score | H_Inde x | G_Inde x | M_Inde x | TC  | Py_Star t |
|---|----|------------|----------|----------|----------|-----|-----------|
| Journal Of Applied Learning and Teaching                            | 12 | 9.0        | 10       | 12       | 5.000    | 163 | 2023      |
| Computers And Education: Artificial Intelligence                    | 11 | 16.8       | 6        | 11       | 3.000    | 271 | 2023      |
| Education Sciences  | 9  | 4.8        | 3        | 9        | 1.500    | 228 | 2023      |
| Cogent Education  | 6  | 2.3        | 1        | 2        | 1.000    | 8   | 2024      |
| International Journal Of Educational Technology In Higher Education | 6  | 19.3       | 4        | 6        | 2.000    | 81  | 2023      |

Source: Data processed by the authors from the Scopus database (2025).

Education Sciences ranks third, with a Cite score of 4.8 and an H-Index of 3, indicating broader coverage but lower impact than in the two preceding journals. Although the number of ChatGPT-related articles is relatively small (N=9), the total number of citations (TC=228) and the G-Index of 9 highlight its contribution to multidisciplinary discourse on educational technology. The low M-Index of 1.500 reflects limited consistency in long-term impact. In the context of ChatGPT, this journal may play a role in exploring pedagogical and policy implications, although it has not yet achieved the level of specialization seen in Computers and Education: AI. Overall, these three journals represent a spectrum of research from technical to social approaches, with the Cite score and H-Index serving as key indicators of academic influence, whereas the TC and G-Index emphasize citation quantity and distribution. These differences underscore the importance of selecting appropriate publication platforms aligned with the research focus, particularly in dynamic fields such as AI in higher education.

Figure 4 illustrates the development of research source production related to the topic of ChatGPT in higher education over time. The horizontal axis (Year) indicates the year (2023), whereas the vertical axis (Cumulative Number) represents the total publications or contributions from these sources. In 2023, there was a significant increase in the accumulation of production, starting 0.0 and reaching 12.5% by the end of the year. This surge indicates that interest and research productivity in this topic developed rapidly during that year, with several sources (such as journals or academic platforms) continuously publishing or hosting works related to ChatGPT within the framework of higher education.

Sources' Production over Time



**Figure 4** Top sources graph. Source: Data processed by the authors from the Scopus database (2025).

The significant cumulative increase in 2023 reflects the rapid development of research in this field, likely triggered by the public launch of ChatGPT and the need to investigate its impact on education. The graph also shows the concentration of source production within a short period, which could be linked to factors such as themed conferences, collaborations between institutions, or special attention from leading journals. This information serves as an important indicator for understanding the momentum of AI-related research in higher education while also providing insights for researchers or institutions to identify





artificial intelligence" (likely referring to the ChatGPT) reinforces the dominant theme of generative language models revolutionizing research, assessment, and learning in universities.

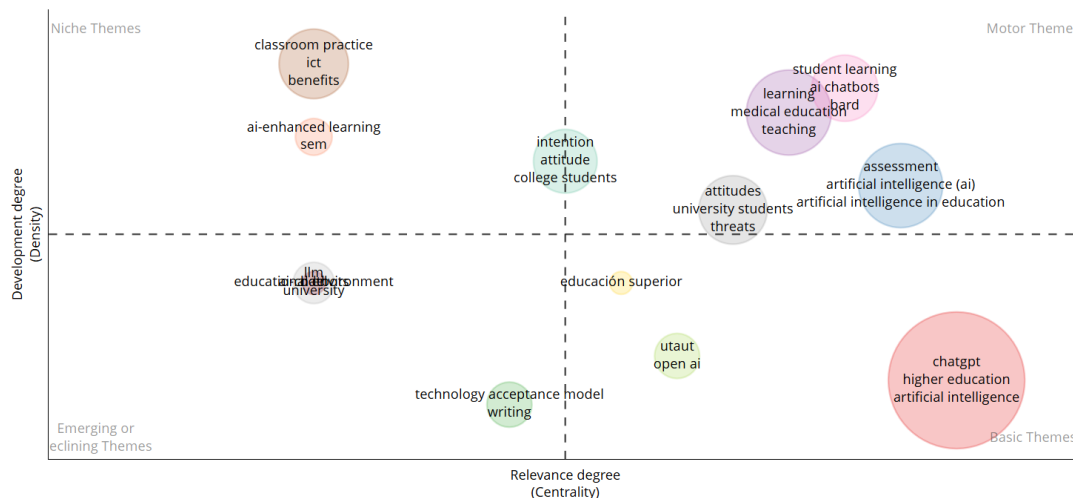


Figure 6 Thematic map. Source: Data processed by the authors from the Scopus database (2025).

Although data on centrality are not explicitly displayed, themes such as "educational environment university" and "education superior" can be assumed to hold high relevance in the research network, as they emphasize macrolevel contexts such as institutional policies, digital infrastructure, and systemic educational transformation. The cluster "assessment artificial intelligence (AI) university students" underscores the urgency of critically evaluating AI risk (e.g., plagiarism, algorithmic bias) in academic settings. Moreover, the combination of the terms "medical education" and "threats" signals an expansion of research into specialized fields such as medicine, where AI content accuracy is critical. The inclusion of the theme "UTAUT open AI" also highlights the need for theoretical frameworks to predict the sustainability of AI adoption. Overall, this thematic map not only illustrates research trends centered on technological innovation but also reveals tensions between AI's potential as a pedagogic tool and the complexities of its associated challenges, such as the need for regulation, faculty training, and curriculum adjustments responsive to digital dynamics.

#### 4. Discussion

This bibliometric analysis highlights an exponential increase in publications related to ChatGPT in higher education, with an annual growth rate of 125.42% between 2023 and 2024. Key implications include the urgency of integrating artificial intelligence (AI) into university curricula to enhance personalized learning, research efficiency, and educational accessibility (Baig & Yadegaridehkordi, 2024; Mondego & Aziz, 2024). Dominant keywords such as students, higher education and learning underscore the focus on AI-driven pedagogical transformation, whereas issues such as academic integrity and assessment highlight ethical challenges, including plagiarism and content reliability. Countries such as the United States, China, and Australia have emerged as major contributors, reflecting strong research capacity and technology adoption. These findings emphasize the need for responsive educational policies, including faculty training, AI-based plagiarism detection tools, and regulatory frameworks, to balance innovation with academic integrity (Hemandkumar et al., 2024). Additionally, disparities in research productivity between developed and developing nations indicate the need for digital infrastructure investment and global collaboration to ensure equitable access to educational technology (Childs & Soetanto, 2017).

ChatGPT has demonstrated effectiveness in enhancing student–faculty interactions, providing instant feedback, and facilitating self-directed learning through interdisciplinary case simulations (Christensen & Knezek, 2017; Lim, 2023). In the United States, institutions such as MIT and Stanford have integrated ChatGPT for market data analysis and business simulation discussions, whereas China leverages platforms such as iFlytek for adaptive vocational training under national initiatives such as AI Education 2030 (Chen, 2025; Ma et al., 2020). However, challenges such as overreliance on AI, algorithmic bias, and low digital literacy among educators hinder its optimal utilization. Case studies in Australia have shown that combining ChatGPT with project-based learning (PBL) improves students’ critical thinking skills, provided that it is balanced with humanistic approaches to preserve creativity (Memmert & Bittner, 2022; Thakur et al., 2024). To maximize benefits, universities must adopt hybrid models that integrate AI with faculty mentoring and develop training modules covering AI ethics and generative content risk management (Chang et al., 2024; Shi et al., 2023). For more specific applications in economics education, empirical studies show diverse patterns of results. Research by Blanco-Arroyo et al (2025) in the context of applied economics revealed that the success of ChatGPT integration is highly dependent on instructor guidance, where students who receive special training are able to utilize it for data analysis and navigate international databases more effectively. Furthermore, findings by Geerling et al. (2023) that ChatGPT was able to rank in the 91st to 99th percentile on the Test of Understanding in College Economics



(TUCE) not only confirmed its ability in basic economic concepts but also emphasized the urgency of redesigning evaluation methods, such as switching to project-based assessments or in-person exams, which cannot be easily circumvented by artificial intelligence. The implication is that a hybrid approach that combines the advantages of AI with human guidance and authentic assessment is crucial to maintaining the integrity and depth of economic learning (Rafsanjani et al., 2025).

The United States, China, and Australia are the most productive countries for generating research and implementing ChatGPT in higher education. The U.S. leads with 67 articles and 138 citations, supported by collaborations between prestigious universities (e.g., Harvard, Stanford) and technology firms such as OpenAI. China ranks second with 66 articles, focusing on indigenous language model development and AI integration in vocational curricula through national policies. Australia, with 64 articles, excels in research on the psychological impact of ChatGPT on adult learners and adaptive learning innovations at regional universities (Mei & Balsiri, 2024). However, this technological integration prompts a necessary reflection on its impact on foundational academic skills. The reliance on AI for tasks such as data analysis, writing, and problem solving, as seen in its application for thesis guidance or market simulations, raises valid concerns about the potential erosion of independent critical thinking and analytical depth among students (Geerling et al., 2023). A critical pedagogical response, therefore, is essential. To harness AI as a partner rather than a proxy, educators must intentionally redesign curricula and assessments. This involves moving beyond fact-based recall to emphasize experiential learning, complex case studies, and proctored evaluations that AI cannot easily replicate—shifting the focus from finding answers to cultivating the ability to ask insightful questions, challenge assumptions, and synthesize information ethically (Blanco-Arroyo et al., 2025; Nuryana et al., 2024). Concrete examples include the use of ChatGPT at the University of Melbourne for medical clinical simulations and at the University of Sydney for thesis writing guidance. These nations not only pioneer research but also set global benchmarks for ethical AI usage, positioning them as key references for sustainable and inclusive technology-driven educational policies (Almusaed et al., 2023; Makhija et al., 2025; Mei & Balsiri, 2024).

## 5. Conclusions

This study confirms the exponential growth of research on the integration of ChatGPT in higher education, with a 125.42% increase in publications between 2023 and 2024, driven by the need for pedagogical innovation and responses to the dynamics of the Industry 4.0 Revolution. The United States, China, and Australia have emerged as leading contributors, reflecting their strong research capacity and technological adoption, while developing nations such as Indonesia still face infrastructure and digital literacy challenges. Thematic analysis reveals a dominant focus on AI-driven learning transformation, such as personalized content and interactive simulations, accompanied by complex ethical challenges—particularly plagiarism, algorithmic bias, and access gaps between demographic groups. These findings underscore the need for a holistic approach that combines regulatory policies, AI competency-based faculty training, and global collaboration to ensure equitable technology benefits. As an academic contribution, this study not only maps the current research landscape through a bibliometric perspective but also provides strategic recommendations for educational institutions and policymakers in designing sustainable, inclusive, and ethically responsive frameworks for the digital era.

## Acknowledgment

The author wishes to express gratitude to all the parties who provided administrative support and material donations, which greatly facilitated this research. On behalf of the entire team, we extend our highest appreciation

## 6. Declarations

### 6.1. Ethical considerations

This research does not require any ethical statements.

### 6.2. Use of artificial intelligence (AI)

The authors declare that the generative artificial intelligence (AI) tool Grammarly was used exclusively for language editing and/or grammatical improvement. The use of AI did not influence the scientific content, study design, data analysis, data interpretation, results, or conclusions of the manuscript. Full responsibility for the content remains with the authors.

### 6.3. Conflict of interest

All the authors declare that there are no conflicts of interest associated with this research.

### 6.4. Funding

This research was conducted under the academic supervision and guidance of the doctoral advisory team from Universitas Negeri Malang (UM). It was financially supported by the LPPM (Institute for Research and Community Service) NON

APBN Universitas Negeri Surabaya (UNESA). The authors express their deepest gratitude to both institutions for their continuous support and collaboration, which made the successful completion of this research possible.

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