Generative Artificial Intelligence and Higher Education: An Overview of Emerging Trends for a Sustainable Future of Generation Z (Gen Z)

*Annu chauhan, **Meenu Shant Priya

Abstract

This study investigates the foundations and current research streams of Generative Artificial Intelligence (GenAI) within the education sector through a comprehensive bibliometric and systematic literature review (SLR). Drawing on 170 articles published in high-ranked journals and indexed in Scopus, the analysis identifies nations, universities, and authors with the highest publication and citation rates, as well as the most frequently used keywords and trending topics over time. The study further explores collaboration patterns among authors and nations, highlighting Mexico's significant role in cross-border partnerships, particularly with the United States, China, and the United Kingdom.The findings reveal that terms such as *Gen Z*, *higher education*, and *sustainable education* dominate the discourse, reflecting the intersection of technological innovation and generational perspectives. Research contributions span diverse disciplines, including social sciences, computer science, business management, engineering, and arts and humanities, with representation from regions such as India, the United Kingdom, Europe, America, Australia, and Asia.By employing tools such as Biblioshiny, VOSviewer, and MS Excel, the study provides insights into student perspectives on the influence of GenAI in higher education. Results underscore the urgent need to reform educational practices to prepare teachers, students, and administrators for future roles in a sector increasingly shaped by GenAI.This examination offers valuable guidance for academics, policymakers, and industry stakeholders seeking to understand the preferences, challenges, and opportunities associated with GenAI adoption. By identifying key themes, trends, and gaps in the literature, the study establishes a foundation for future research directions, particularly in relation to Gen Z's engagement with higher education in a rapidly evolving technological landscape.

Keyword: Generative Artificial Intelligence (GenAI); Gen Z; Higher Education; Sustainable Education; Personalization; Student Engagement; Bibliometric Analysis; VOSviewer; Systematic Literature Review

1. Introduction

"Generative artificial intelligence in higher education: challenges, opportunities and future course of actions to achieve sustainable development goals" **(D Koroleva, 2025)**

-Jogezai, Koroleva, & Ivanov (2025)

On 30th October to 13th November 2025 UNESCO gave guidelines in 43rd session in general conference to put emphasis on Generative Artificial Intelligence in education and research in which several points are considered like:" UNESCO first global guidance on GenAI in education aims to support countries to implement immediate actions ,plans long-term policies and develop human capacity to ensure a human centered vision of these new technologies **(unesco, 2025)**

*Research Scholor, Galgotias University, Greater Noida (UP)
Email id – annu.22gsob3010019_phd22@galgotiasuniversity.edu.in
**Professor,Galgotias Unuversity, Greater Noida (UP)
Email id –meenu.priya@galgotiasuniversity.edu.in

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The concept of "Generative Artificial Intelligence" (GAI) emerges as a disruptor in the digital landscape **(Strobel1, 2023)** With capabilities to generate high-quality, contextually relevant content almost indistinguishable from human-created work, discussions arise on whether this new technology even holds early signs of artificial general intelligence **.**The fast-changing and continuously evolving landscape of GAI calls for an extensive conceptualization of the properties and capabilities to fathom the phenomenon **(Strobel1, 2023)**

Artificial intelligence (AI) refers to the field of computer science concerned with creating systems that simulate aspects of human intelligence, such as problem-solving, learning, reasoning, and perception. Generative AI (GAI) is a subset of AI that focuses on the creation of new content, such as text, images, code, or other media, using learned patterns from existing data **(Sai-Leung Ng 1, p. 2025)**

The pursuit of UN Sustainable Development Goal 4 (Quality Education) advocates for inclusive and equitable quality education for all but its achievement is confronted by persistent disparities, particularly in resource-scarce regions. Generative artificial intelligence (GAI) may offer transformative solutions, yet it introduces potential complexities to the educational landscape .The integration of GAI in education systems worldwide is critical, especially in the wake of the COVID-19 pandemic, which underscored the limitations of the traditional teaching models and resulted in millions of children being at risk of falling behind in basic numeracy and literacy. **(Tang, 2024)**

As a rapidly evolving field, the capacity of Generative Artificial Intelligence to generate new content has drawn the attention of academics and practitioners. Its application ranges from personalized learning to content creation, raising questions about its impact on educational equity **(V Pachava, 2025)**.While Generative Artificial Intelligence has the potential to democratize education by accommodating diverse learning needs .it also raises concerns about the digital divide and ethics . Education systems often fail to adapt to individual learning differences, resulting in frustration and disengagement Generative Artificial Intelligence can personalize learning, transforming studies into interactive experiences **(NA Jogezai, 2025).** However, the scarcity of quality educational resources in underprivileged regions is an ongoing barrier Generative Artificial Intelligence has the potential to fill this void by providing diverse educational materials, thus promoting more equitable access to education **(Prema Nedungadi 1, 2024)**

The implications of Generative Artificial Intelligence extend to higher education by enhancing student engagement and increasing academic integrity **(Prema Nedungadi 1, 2024).** Furthermore, AI-powered translation tools can support cross-cultural understanding and contribute to global learning communities, advancing gender equity and education for vulnerable groups. For educators, Generative Artificial Intelligence offers an opportunity to shift from administrative tasks to more impactful personalized teaching and mentoring **(Prema Nedungadi 1, 2024)**

This paper examines the utilization of Generative Artificial Intelligence to meet the SDG4 targets, aiming to mitigate educational inequalities and enhance learning through technology. This underscores the importance of adaptable and personalized learning solutions, as evidenced by the sudden shift to digital platforms during the pandemic **(Raman, 2025)** This study aims to analyze the extent of research output and emerging research focus and identify potential future research areas within the sustainable development framework in education for sustainable development. This will facilitate an integrated approach to sustainable development **(Wadim Strielkowski, 2024).**

The analysis results show that the publication trend has considerably escalated scientific output since 2022, reaching its highest point in 2024 and 2025. From the title and keyword analysis, the study found that research focuses mainly on indicators of sustainability's environmental and economic dimensions, often neglecting indicators of the social aspect of sustainable development. These findings help identify emerging research interests and map future research directions and policy interventions. It also identified a research gap for researchers interested in this area, particularly in social sustainability, to conduct systematic meta-analyses and empirical research in specific study areas.

Consequently, this research endeavor seeks to bridge this evidence gap comprehensively.

The investigation centers on critical factors that could hinder educational sustainability, encompassing data privacy, security concerns, data policies, and regulatory frameworks. By examining these factors, this study aims to garner a deeper comprehension of the impact of Generative Artificial Intelligence adoption on educational sustainability within higher education institutions in the India and address the distinctive opportunities and challenges inherent to this region. Considering these challenges, this study will examine the following objectives:

i. To investigate the perceived significant relationship between Generative Artificial Intelligence adoption and educational sustainability in higher education

ii. To examine the perceived significant influence of Generative Artificial Intelligence policies and regulations on educational sustainability among higher education institutions in the India.

iii. To examine the significant relationship between trust (data privacy and security concern) towards educational sustainability while using Generative Artificial Intelligence

Hence, this study differs from previous work regarding analytical objectives, keywords, scope, sample size, focus area, database, and findings.This study aims to assess trends in research education for sustainable development, identify new areas of focus for researchers in this field, and identify potential areas for further research. As a result, this study employed bibliometric analysis; it addresses the following research questions:

1. What are the current experiences, perceptions, knowledge, and concerns of Gen Z students regarding the use of Generative Artificial Intelligence in Higher Education?
2. What are the current intentions and concerns of Gen Z students and teachers, along with any accompanying reasons, towards using Generative Artificial Intelligence in higher education?
3. How the use of Generative Artificial technologies effect teachers teaching process and Student learning Process?

The paper is structured as follows. Next, we detail the methods used in the selection and revision of the papers, including the inclusion and elimination criteria. Then, we provide a brief description of the paper's content, including the categories in which this content can be grouped (topics and methodologies used). This is followed by a discussion of the results and a proposal for a future research agenda. The paper ends with a conclusion and the presentation of the limitations of this research.

2. Materials and Method

The research utilized an SLR and Biblometric analysis methodology, which involved a series of structured steps: planning (defining the research questions), conducting (executing the literature search, selecting studies, and synthesizing data), and reporting (writing the report). This process adhered to the PRISMA guidelines . **(J Batista, 2024)**

The subsequent step involved identifying the search strategy, study selection, and data synthesis. The search strategy included the selection of search terms and the literature resources, and the overall search process. Deriving the research question aided in defining the specific search terms. For the eligibility criteria—comprising the inclusion and exclusion criteria for the review and the method of grouping studies for synthesis—we opted to include only articles that describe scientific empirical research on the use of GAI in higher education. In this context, we define empirical research as investigations in which researchers collect data to provide rigorous and objective answers to research questions and hypotheses. This approach intentionally excluded articles based solely on opinions, theories, or speculative beliefs to ensure a foundation of concrete evidence. We decided to use Scopus and WoS as our databases, with the search being conducted in January 2024. The next step was to identify synonyms for the search strings **(J Batista, 2024)**

A meticulous approach was employed to present an insightful overview of the interplay between Generative AI and sustainability in higher education. This section elucidates our research's methodology, drawing from a systematic literature review strategy. While our methods gleaned insights from broad spectrums of available literature, they have been fine-tuned to focus on the intricate details pertinent to the domain of Generative AI and its convergence with sustainability of higher education(Rame Rame a, 2024)

2.1 Research Design

This study employs a systematic review approach to identify, evaluate, and synthesize the existing body of literature on teachers' preparation for teaching in the digital environment. The systematic review methodology allows for a structured and comprehensive analysis of relevant studies, ensuring that the findings are both rigorous and

reproducible. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were followed to enhance transparency and minimize the risk of bias throughout the review process.

2.2 Database Selection and Search Strategy

The search restrictions considered in Scopus were as follows: title, abstract, and keywords; period: since 1 January 2021; document type: article; source type: journal; language: English; publication stage: final and article in press. The search equation used was as follows: TITLE-ABS-KEY ((“higher education” OR “university” OR “college” OR “HE” OR “HEI” OR “higher education institution”) AND (“generative artificial intelligence” OR “generative ai” OR “GENAI” OR “gai”)) AND PUBYEAR > 2022 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (SRCTYPE, “j”)) AND (LIMIT-TO (PUBSTAGE, “final”) OR LIMIT-TO (PUBSTAGE, “aip”)) AND (LIMIT-TO (LANGUAGE, “English”)). As a result, we gathered 91 articles, of which only 67 were available. The search results were documented, and the articles were extracted for further analysis.

The search restrictions in the WoS were as follows: search by topic, including title, abstract, and keywords; period: since 1 January 2021; document type: article; language: English; publication stage: published within the specified period. The search equation used was as follows: TITLE-ABS-KEY ((“higher education” OR “university” OR “college” OR “HE” OR “HEI” OR “higher education institution”) AND (“generative artificial intelligence” OR “generative ai” OR “GENAI” OR “gai”)), with the previously outlined restrictions. As a result, we collected 67 articles. Eight of these articles were unavailable. One article was excluded because its title was in English, even though the article itself was written in Portuguese. Thus, we considered a total of 52 articles. The search results were documented, and the articles were extracted for further analysis.

The entire process was initially tested by the three researchers, with the final procedure implemented by one of them. All the articles were compiled into an excel sheet, where duplicates were identified and removed. This resulted in a final list of 67 articles.

The next step involved selecting the articles. The complete list was divided into three groups, with each group assigned to a different researcher. Each researcher reviewed their assigned articles, evaluating whether the keywords aligned with the search criteria and whether each article included empirical research. This evaluation was based on the abstract and, if necessary, the full article. For each article, the researcher provided one of three possible responses, based on the items just mentioned (keywords, the abstract, and, if necessary, the full article): “Yes” for articles the researcher was certain to include, “No” for those clearly to exclude, or “Yes/No” for cases where there were uncertainties about inclusion, indicating that the researcher was not entirely sure about including or excluding the article.

2.3 Data Extraction and Analysis

Data from the selected studies were extracted systematically, focusing on key themes such as the methods used in teacher preparation, the challenges and opportunities associated with teaching in digital environments, and the effectiveness of different training programs. The extracted data were then analyzed to identify trends, common findings, and gaps in the literature. Bibliometric analysis tools such as VOSviewer were employed to visualize keyword co-occurrence, collaboration networks, and the geographical distribution of research. This analysis helped to provide a comprehensive overview of the current state of research on teachers' preparation for teaching in digital environments, highlighting areas for future investigation.

The PRISMA diagram (**Figure 1**) illustrates the systematic review process, starting with the identification of 131 records from databases. After removing duplicates and ineligible entries, 61 records proceeded to the screening stage. Of these, 34 were excluded based on title and abstract evaluation, leaving 27 reports for retrieval. However, 5 reports could not be retrieved, and 22 were assessed for eligibility. Ultimately, 1 report was excluded due to language constraints, resulting in 21 studies being included in the final review. This process highlights the rigorous filtering applied to ensure the relevance and quality of the studies selected for the systematic review.

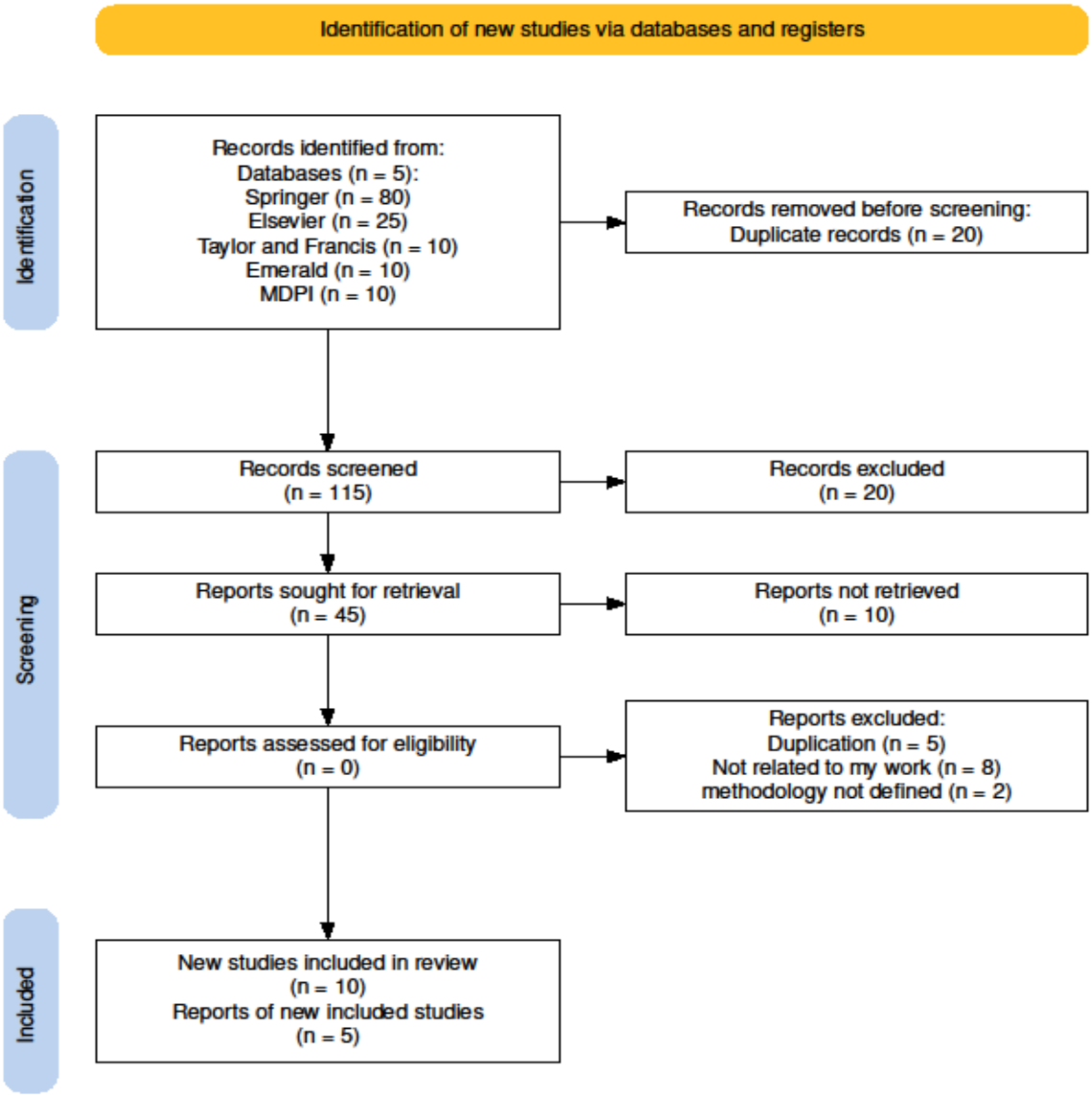


Figure 1. A PRISMA 2020 flow diagram illustrating the selection process of studies, using the template provided .https://www.eshackathon.org/software/PRISMA2020.html

Source :(Data is Extracted from the Scopus)

Table :1 Countries –wise Comaparison Charts using Generative Artificial Intelligence

Country/region	Any use (ever tried)	Regular use (monthly+)	Most-used tool(s)
India	55–75%	20–35%	ChatGPT; Gemini; Claude
United States	50–70%	20–35%	ChatGPT; Gemini; Claude
United Kingdom	50–65%	15–30%	ChatGPT; Gemini; Claude
Hong Kong	60–80%	25–40%	ChatGPT; Gemini; Claude
Global (multi-country)	55–75%	20–35%	ChatGPT; Gemini; dominant

Fig:2 Data of Generative Artificial Intelligence (GenZ) in Higher Education in India with comparison with other Countries .

Source : https://www.arcjournals.org/pdfs/ijrscse/v11-i2/2.pdf

Table -3 Top 10 Most Cited Paper with their key finding and Research Problem with the Paper title

Research problem	Title
How GenAI has been adopted in HE during the first two years post-ChatGPT	Pedagogical applications of generative AI in higher education: A systematic review of the field
What are the dominant GenAI use cases and governance gaps in HE?	Generative AI and higher education: Trends, challenges, and future directions from a systematic literature review
How LLMs affect student learning and assessment integrity	ChatGPT in higher education: Hype or help?
Balancing GenAI' s educational benefits with ethical safeguards	Opportunities and risks of generative AI for education
How LLMs challenge traditional assessment and integrity systems	Chatting and cheating? The impacts of AI on academic integrity
Instructor responses to LLMs in curricula	How worried should we be? The impact of ChatGPT on teaching and assessment
Are health-professions programs prepared for GenAI integration?	Generative AI in medical education: A scoping perspective on readiness
What governance frameworks can guide GenAI use in HE?	A framework for ethical generative AI adoption in higher education
Do LLM-mediated feedback loops improve writing outcomes?	Large language models for feedback: Effects on student writing quality
How do LLMs affect novice programmers' learning and cheating risks?	Generative AI for programming education: Impact on novice learning
What competencies do faculty need	Responsible GenAI literacy for faculty:

Key findings	
Rapid adoption focused on writing assistance, formative feedback, course design, and coding; concerns center on assessment integrity, bias, and faculty development needs	
Dominant uses: tutoring, content generation, grading support; gaps: data protection, bias audits, academic integrity policies; calls for institutional GenAI literacy programs	
Benefits in feedback and scaffolding; risks include plagiarism, hallucinations, inequity; recommends transparent policies and assessment redesign	
Highlights accessibility gains and creativity support; urges bias handling, attribution norms, and data governance mechanisms	
Identifies urgent need for authentic assessment, process-based grading, and integrity education; technical detection alone is insufficient	
Encourages assessment diversification, reflective learning, and explicit GenAI use policies to harness benefits while reducing misconduct	
Uneven readiness; recommends curricula on AI literacy, data ethics, and clinical reasoning augmentation	
Proposes layered governance: course-level disclosure, institutional audits, and student consent; emphasizes equity impacts	
Mixed gains for structure and grammar; weaker for argumentation; best outcomes when combined with human feedback	
Improved debugging and conceptualization; elevated shortcutting risks; recommends " think-aloud" and code tracing assessments	
Maps competencies; prompt craft, bias awareness	

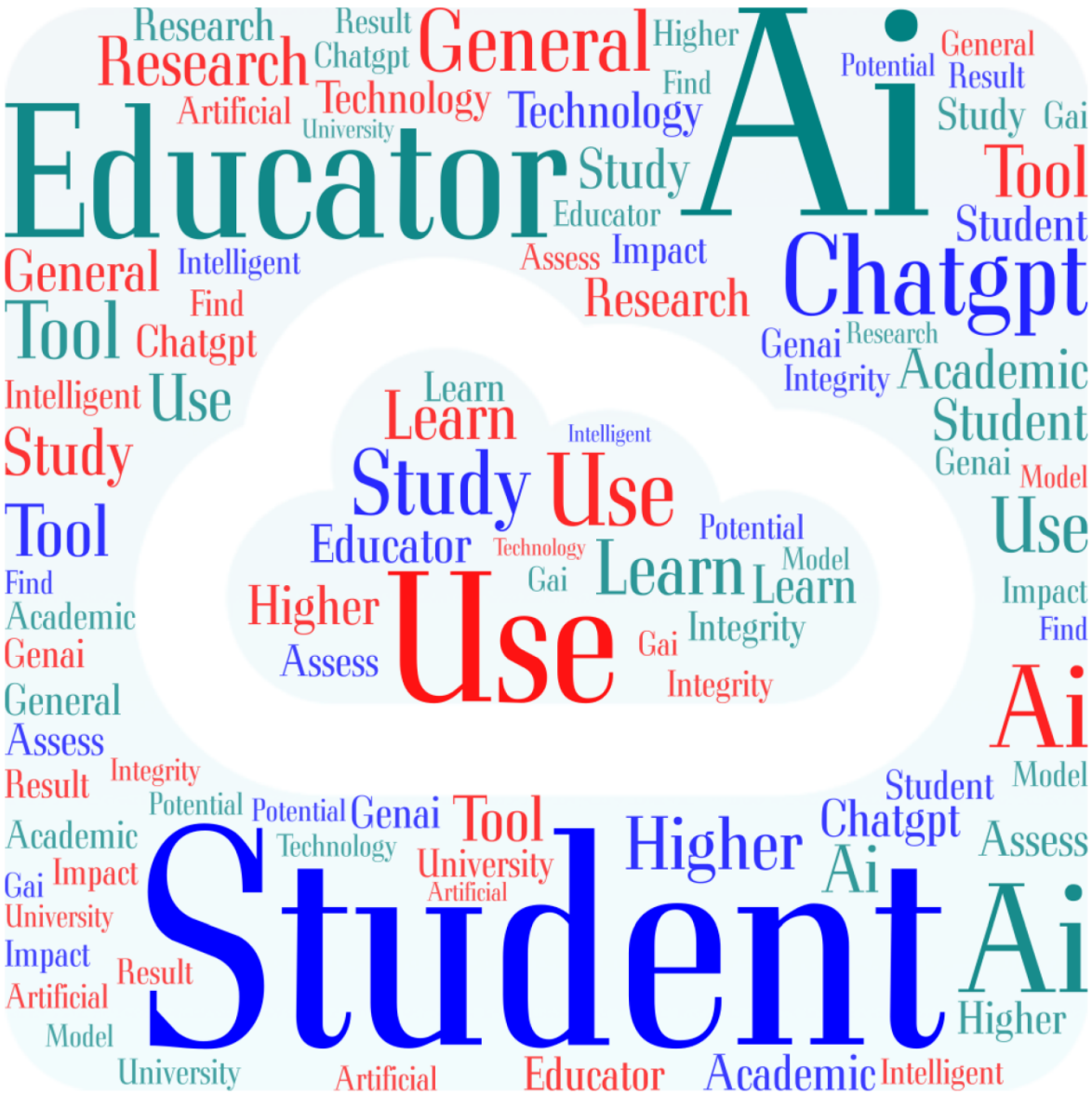


Fig 3: A word cloud generated from the abstracts of the 37 selected articles, highlighting the most frequently occurring words, with words that occurred at least 25 times.

Each researcher independently conducted a grounded theory exercise using all the previously gathered information, including the articles themselves, to identify potential categories for each article. After this individual analysis, the three researchers combined their findings, resulting in the categorization and distribution of articles presented. We established three main categories for the 37 selected studies: the use of GenAI, stakeholder acceptance and perceptions, and specific tasks and activities. While some overlap exists—since stakeholders' use of GenAI often involves tasks like content analysis and content generation—this structure was chosen to capture distinct aspects of GenAI's impact on higher education. The aim of this process was to provide a comprehensive view of the various dimensions of GenAI applications and their interactions across different areas.

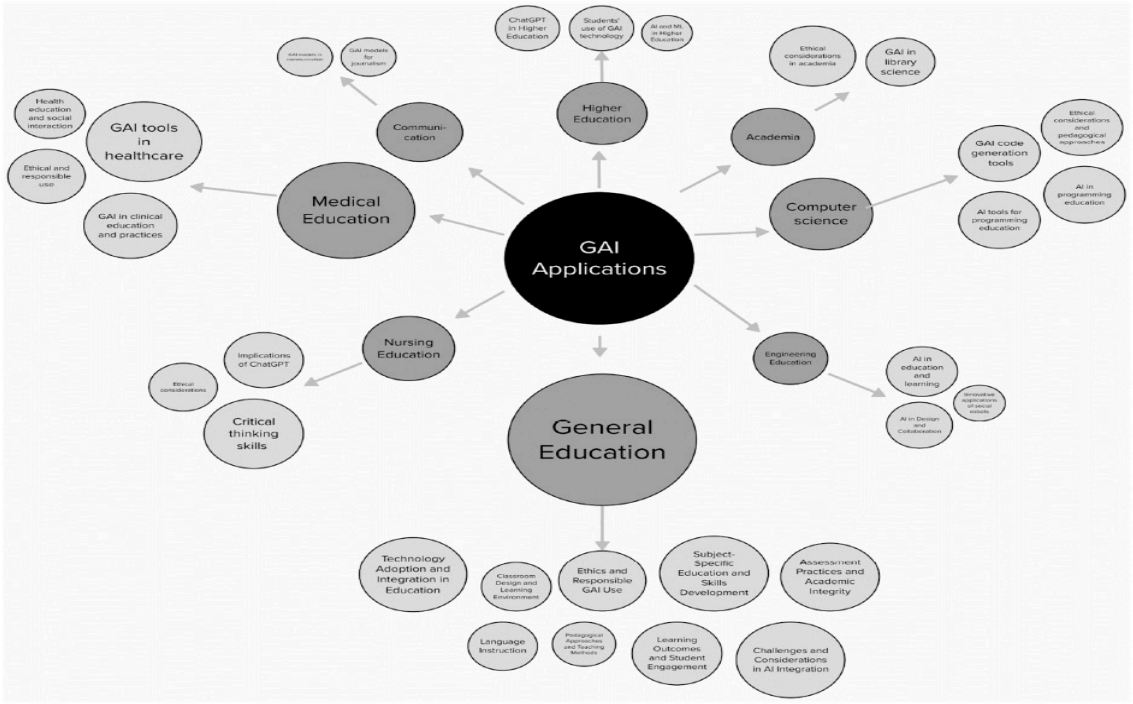


Fig 3. Summary of GenAI Research and Application in Education

Source: Transforming education: A comprehensive review of generative artificial intelligence in educational settings through bibliometric and content analysis (Z Bahroun, 2023)

USES OF AI

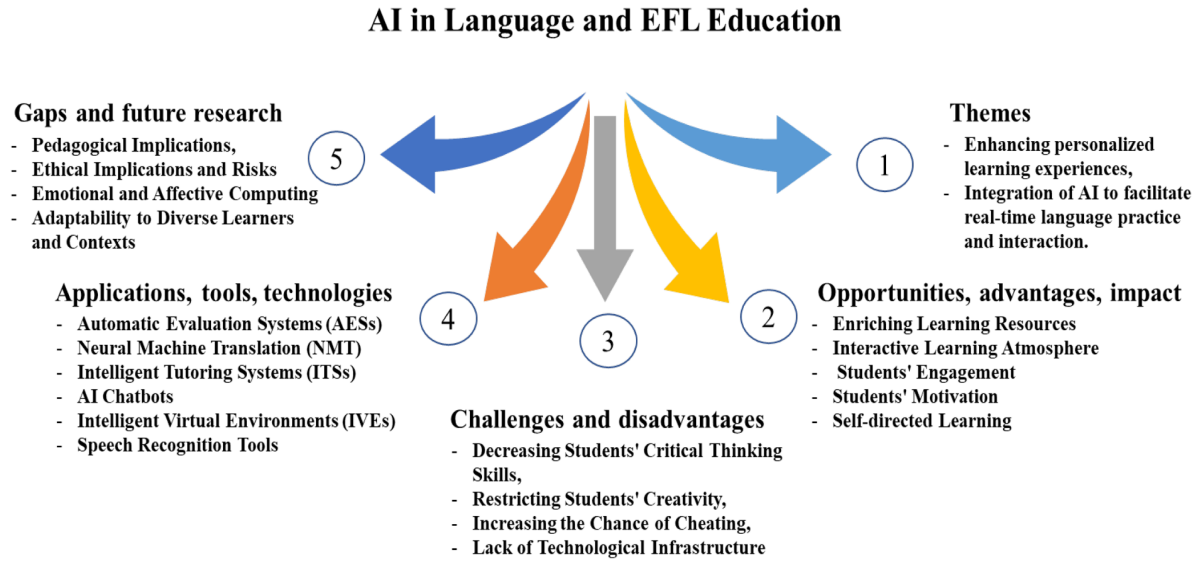


Fig 4: Uses and importance of Generative Artificial Intelligence in education

Source:(https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=A+systematic+and+bibliometric+review+of+artificial+intelligence+in+sustainable+education%3A+Current+trends+and+future+research+directions&btnG=)

3. DATA COLLECTION METHOD

This bibliometric analysis study used Scopus, a scientific database recognized for offering one of the most comprehensive collections of peer-reviewed literature. Moreover, Scopus is known for its extensive coverage, indexing peer-reviewed journals across multiple disciplines. It also provides strong 59 citation metrics, making it a valuable tool for bibliometric analysis. Its strict editorial criteria also ensure that only reputable journals are included, reducing the chances of low-quality sources. Scopus was chosen over other databases due to its extensive coverage of peer-reviewed journals across multiple disciplines, ensuring a more comprehensive dataset. It offers advanced citation analysis tools, detailed author profiles, and structured metadata, which enhance research tracking and bibliometric studies; as compared to Google Scholar, which includes non-peer-reviewed sources, Scopus provides more curated and reliable data. While the Web of Science is prestigious, its journal selection is more limited, particularly in non-English publications The search keywords Artificial Intelligence, AI, and sustainable education were included in the title article search on January 4, 2025, resulting in 422 documents published between 2016 and 2025. While compiling the dataset, editorials, notes, and reports were excluded to ensure the analysis focused on peer-reviewed, research-based academic contributions. These document types were omitted primarily because they typically lack empirical data, methodological rigor, and standardized peer-review processes, which are essential for bibliometric consistency and reliability. Editorials and notes often represent opinion pieces or brief commentaries, while institutional reports may vary widely in structure, scope, and academic validation. I refined the dataset to 170 documents comprising articles and conference articles.

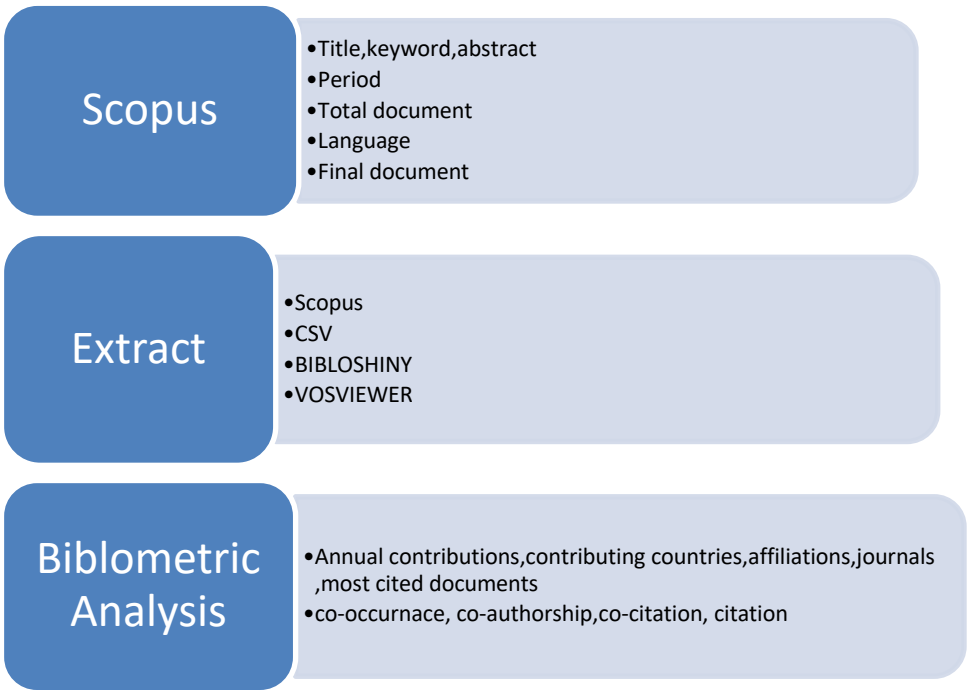


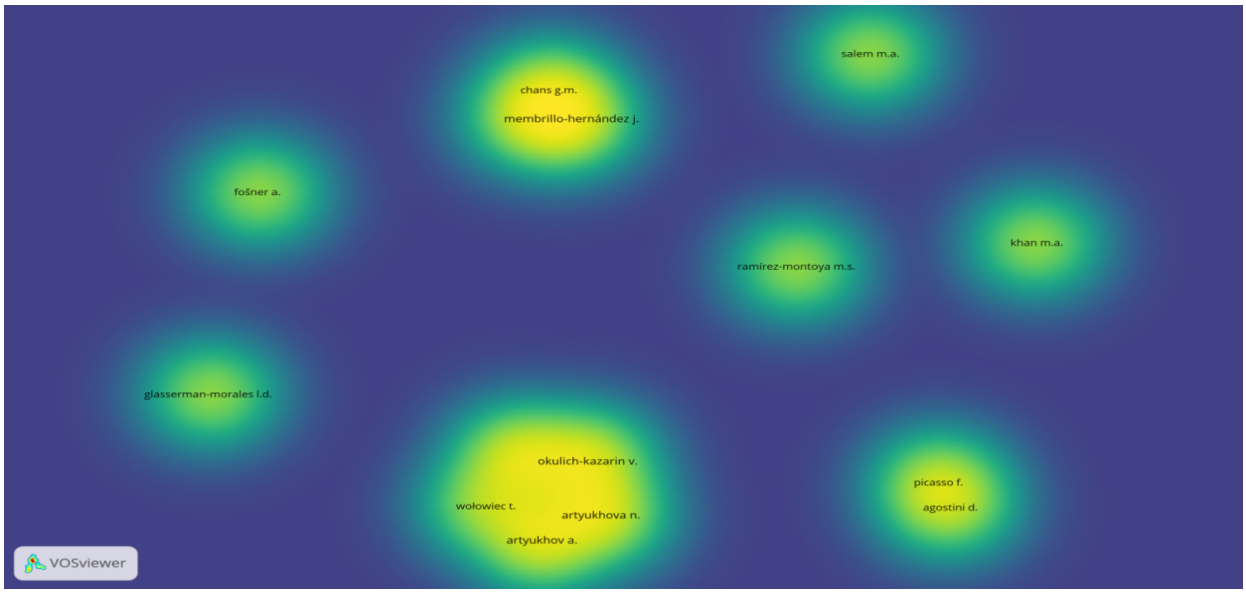
Fig 5: Data Collection and Analysis Procedure
Source: (Developed by Researcher)

3.2 Systematic Literature Review (SLR)

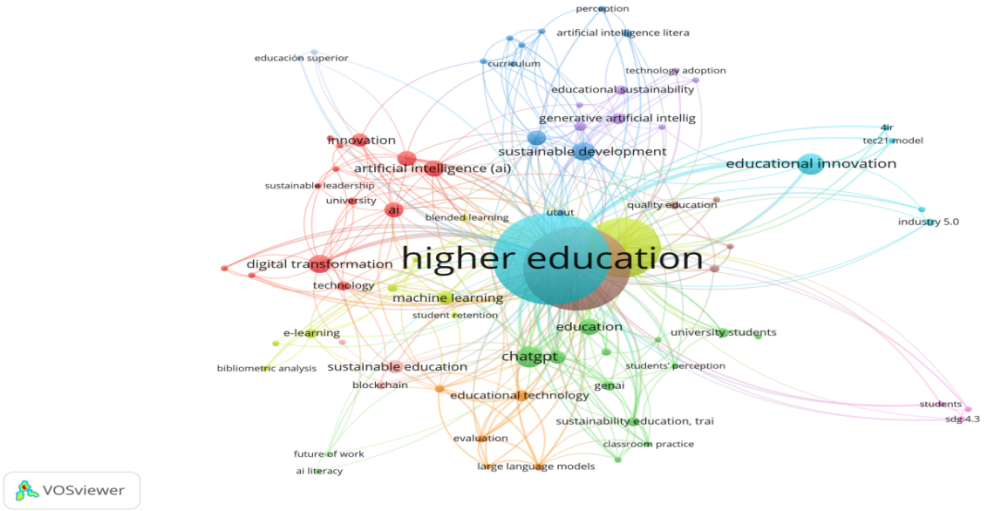
The SLR followed PRISMA guidelines, focusing on peer-reviewed articles published between 2018 and 2025. Inclusion criteria were studies that explicitly addressed AI applications in sustainable education. The literature was categorized into themes such as personalized learning, ethical AI, accessibility, and teacher augmentation.

3.3 Biblometric Analysis through Vosviewer

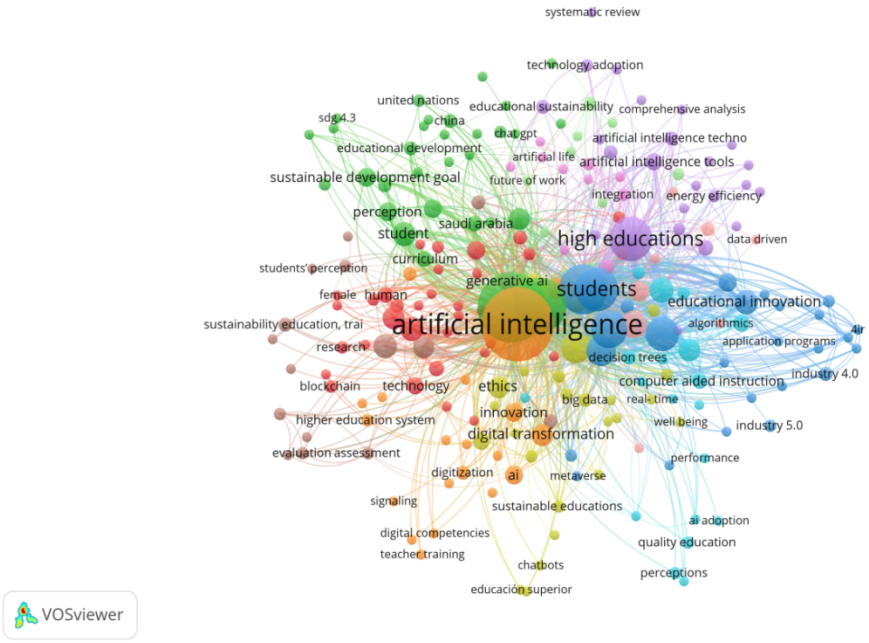
4.Co-Authorship Map Based on Author

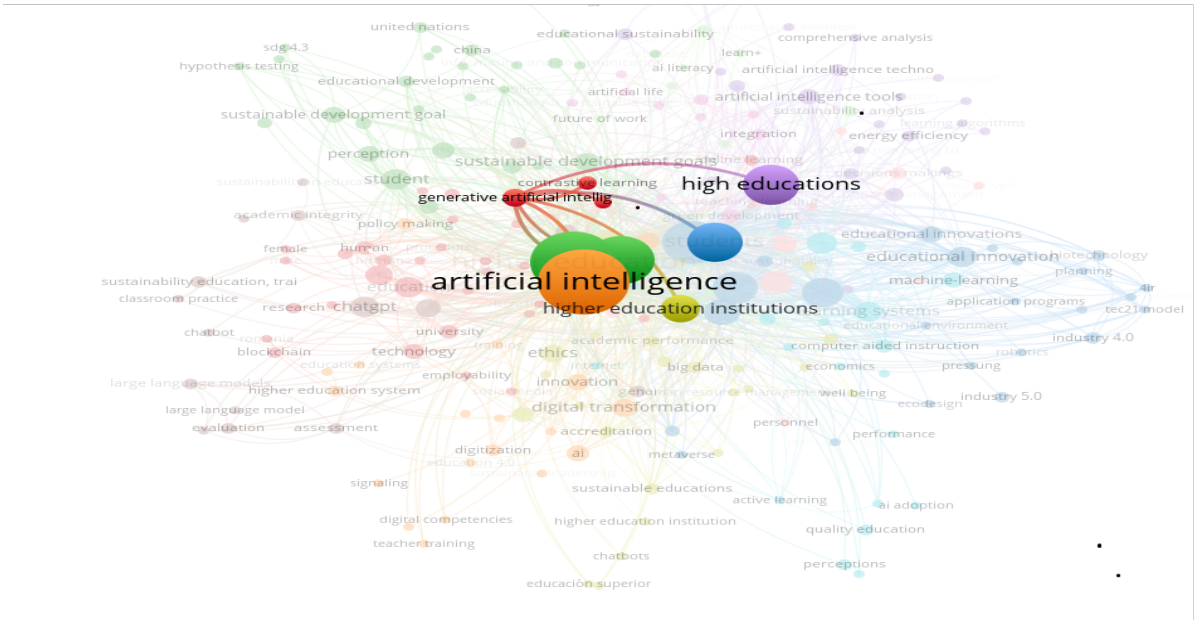


. ***4.2 Co-Occurrence Map Based on Author Keyword***

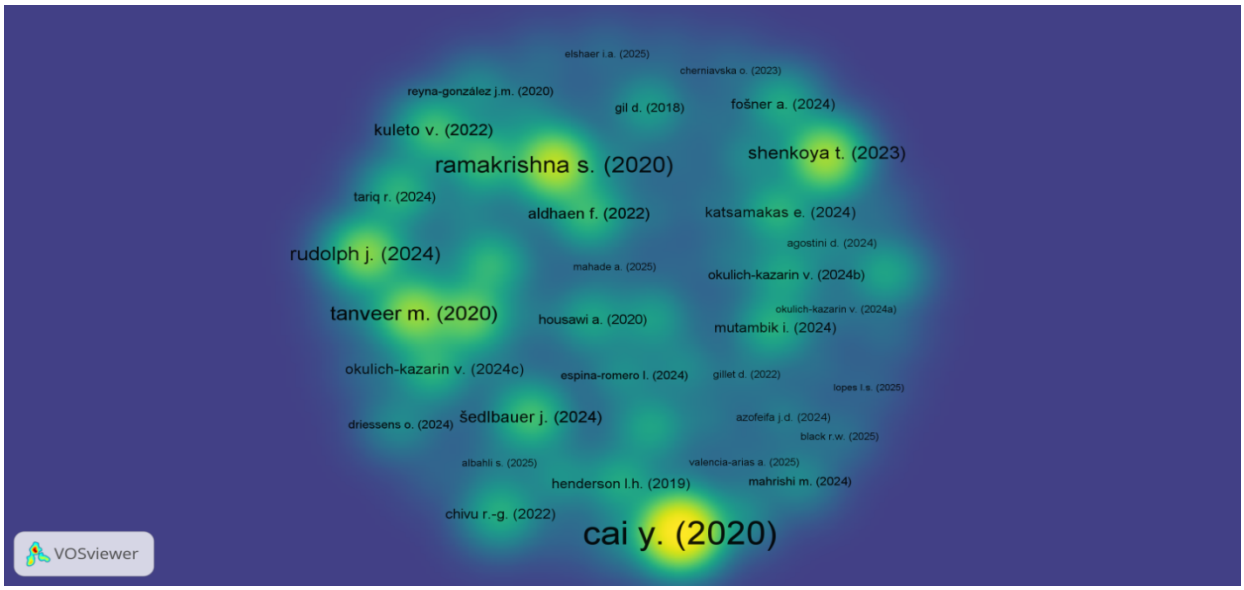


4.3 Co-Occurrence Map Based on All Keyword

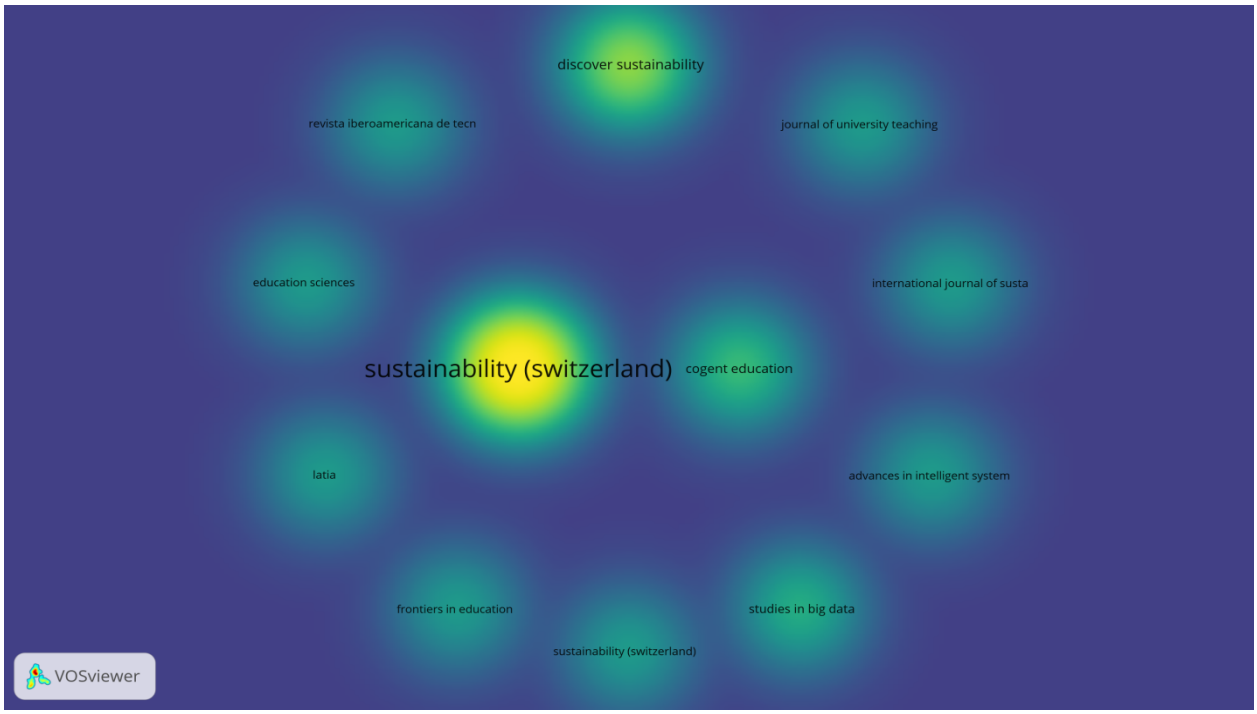




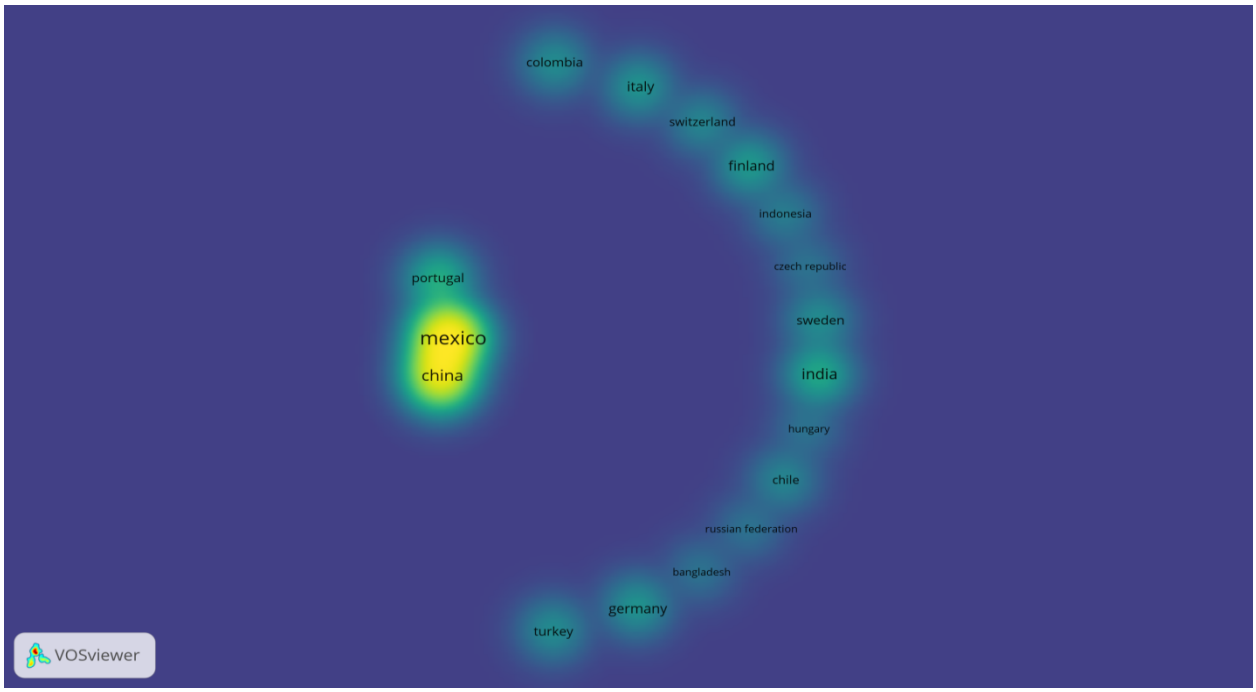
4.4 Citation Map Based on Documents



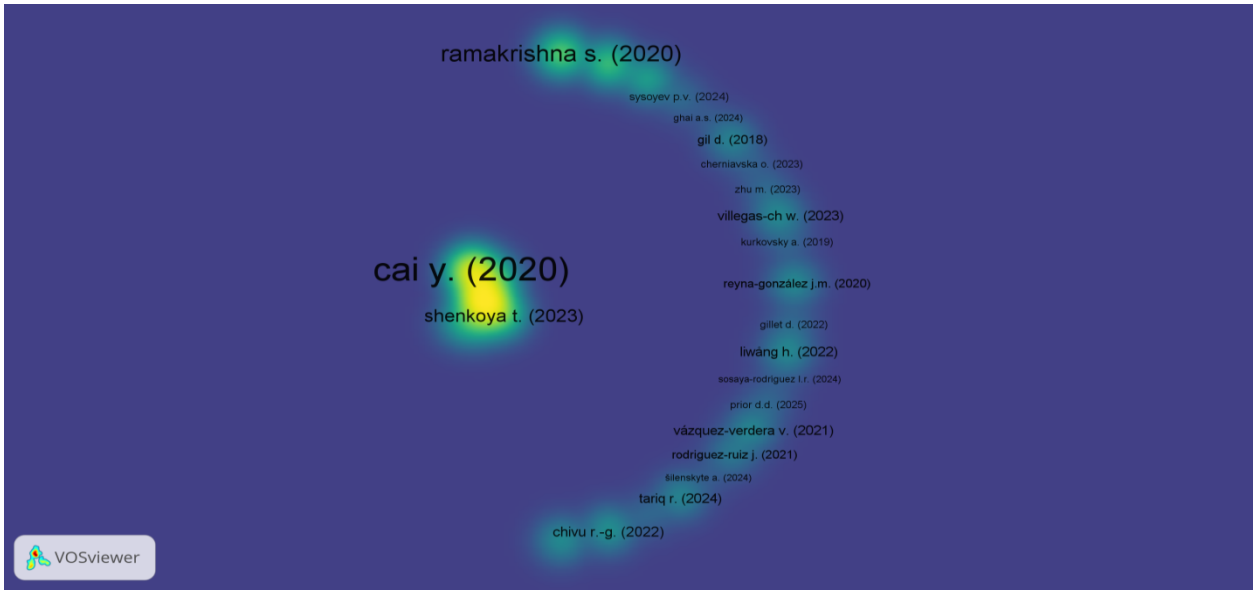
4.5Citation Map Based on Sources



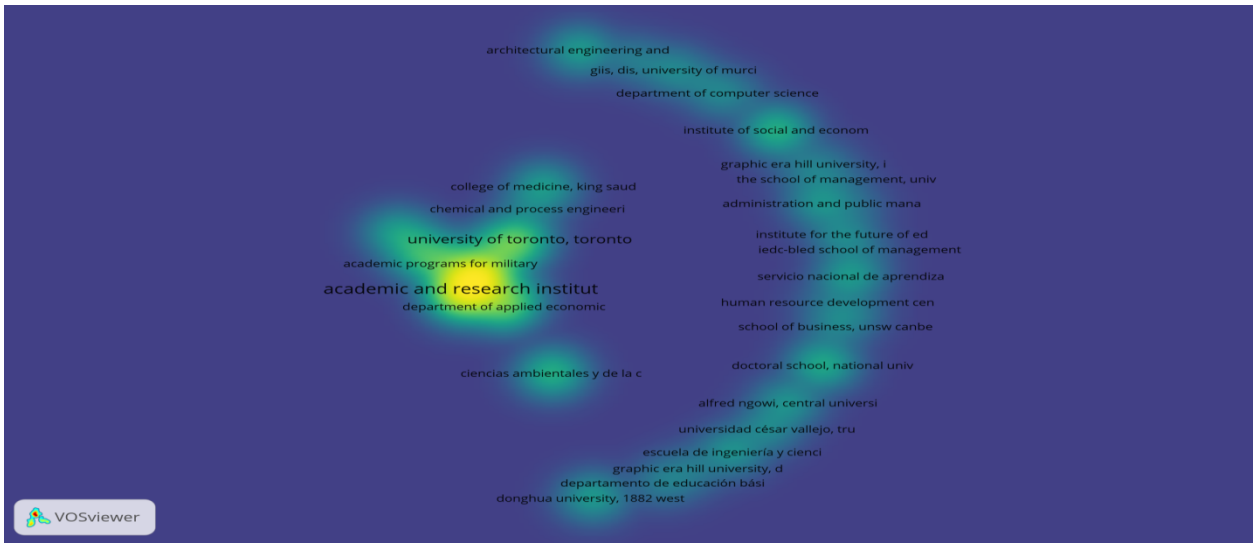
4.6 Citation Map Based on countries



4.6 Biblographic Coupling Map Based on Documents



4.8 Biblographic Coupling Map Based on Organization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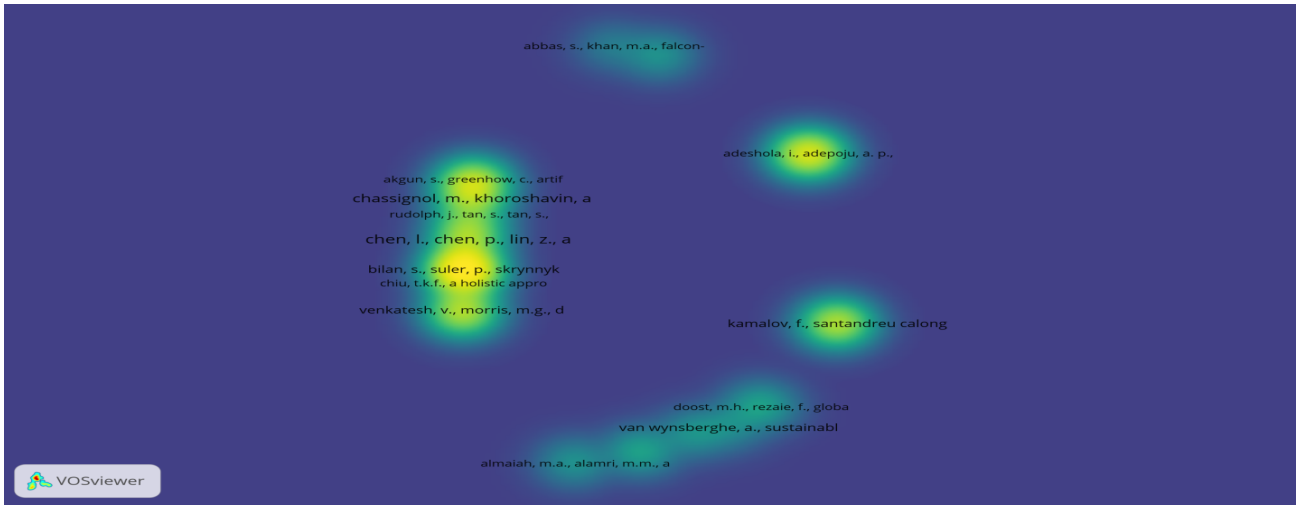
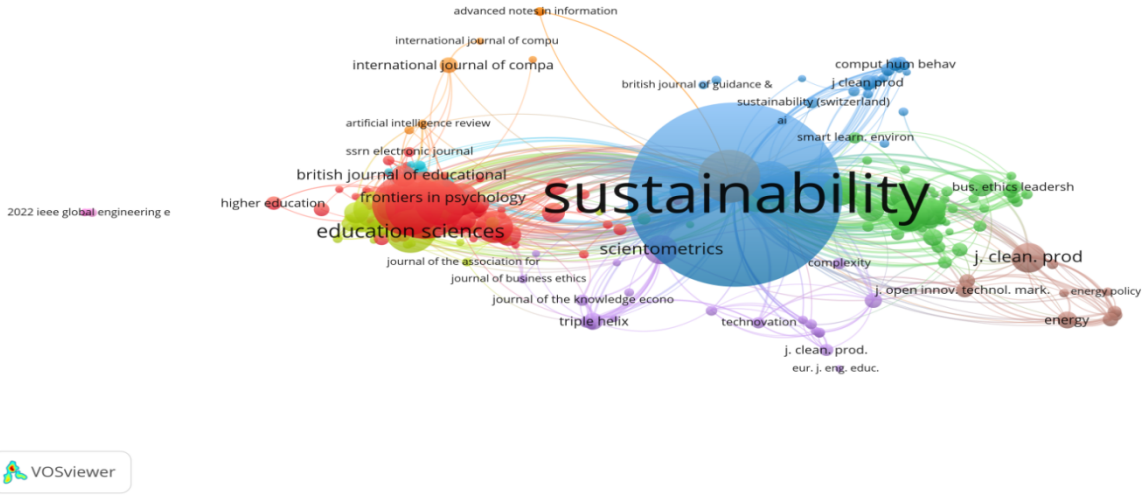
4.8 Co-Citation Map Based on Cited refrence



4.8 Co-Citation Map Based on Cited Source



4.8 Co-Citation Map Based on Cited Authors

Content Analysis

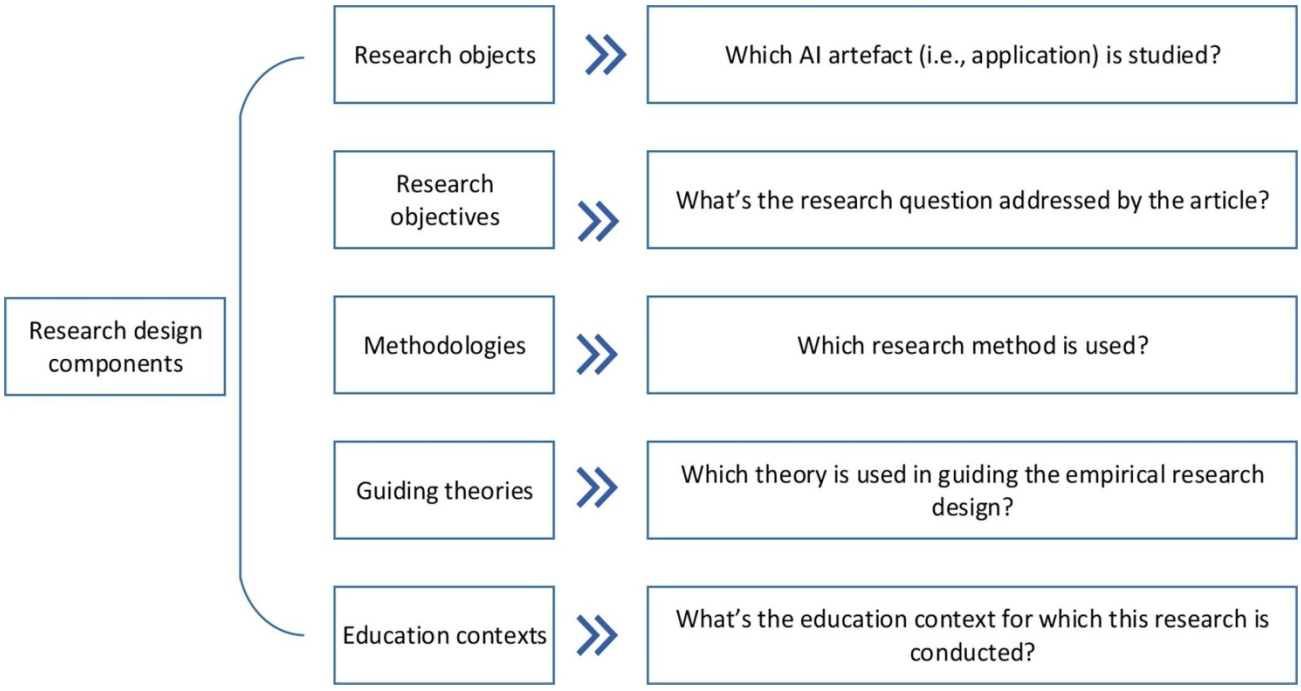
Bibliometric analysis is inherently data-driven and does not probe into the content details of research articles. Consequently, we complement the bibliometric analysis with a systematic literature review that involves manual content analysis of a smaller sample of articles. The results obtained from the co-occurrence network analysis serve as a foundation for coding the selected papers in the systematic review. The results pertaining to research designs from the content analysis are summarize and also illustrates a mapping between concepts derived from the co-occurrence,co- authorship analysis , Co- citation analysis network analysis and those derived from the systematic analysis of the selected papers.

Paper selection and Analysis

To select a subset of papers for content analysis from the initial pool of 1534 papers used in the bibliometric analysis, we applied the following criteria: (1) Papers that are published in journals of the category quartile Q1 in the Journal Citation Reports; (2) Papers that clearly describe the AI applications under study and report their impact on teaching and learning; and (3) Papers that contain an empirical study. We focus on empirical studies because they go beyond conceptual understanding and provide empirical evidence in addressing specific research questions. Understanding their content and research methods can provide valuable insights into the development of the AIED research field and guide future research. A total of 170 papers were identified for content analysis.

Data analysis on data sources

We coded common components of research design in each article. These components included research objects, objectives, methodologies, guiding theories, and educational contexts.



Methodology of Research

Source:https://www.sciencedirect.com/science/article/pii/S0957417424010339#s0015

4.Result

4.1 Main Information

Based on the established inclusion criteria, 170 papers were selected for the final analysis. Consequently, the subsequent section encompasses the descriptive analysis of the study. Basic information regarding the study is presented in Tables 2 and 3. The study materials were collected from publications released between 2016 and 2025 sourced from 291 journals. A total of 168 authors from various nations worldwide contributed to the publications. Among these,

20 documents were authored individually, while the remaining papers were the collaborative work of multiple authors

Table 3 Data of Countries with no. of Documents

COUNTRY/TERRITORY	NO. OF DOCUMENTS
Chile	5
Colombia	6
South Africa	6
Turkey	6
United Arab Emirates	6
Germany	7
Italy	7
Malaysia	7
Australia	9
India	10
Spain	10

United Kingdom	12
China	13
United States	13
Saudi Arabia	14
Mexico	19

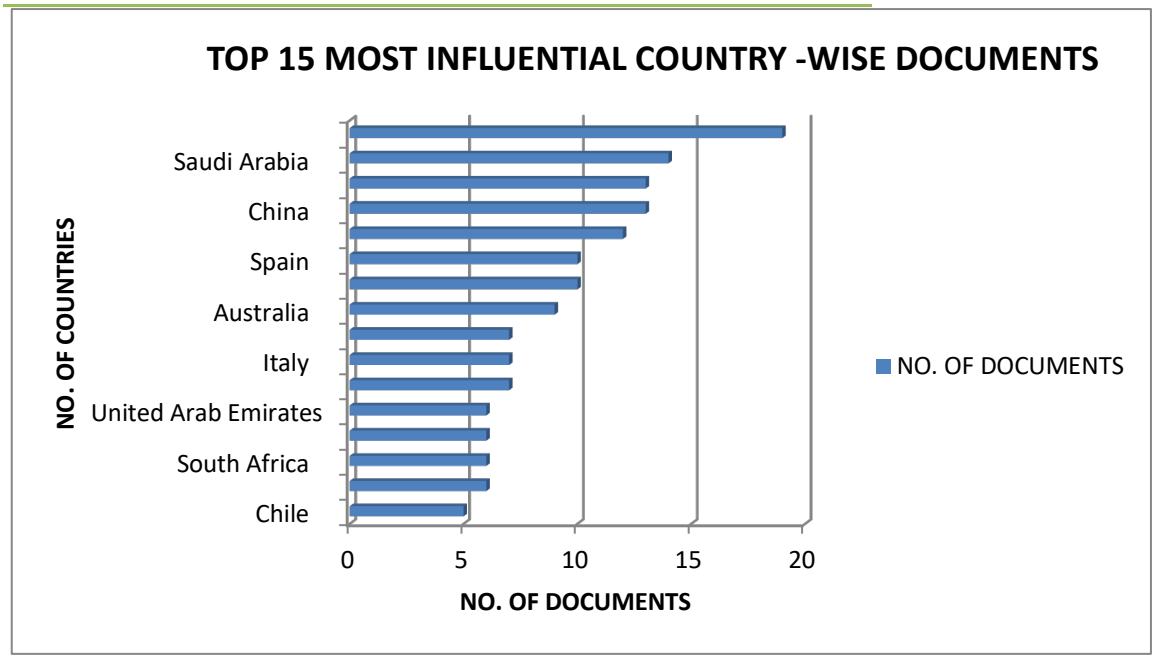


Fig 6: Extracted documents by Data of Top 15 most influential Country- wise (Source: compiled by authors from Scopus Analysis's 2025)

Table 4 Data of Authors with no. of Documents

AUTHOR NAME S	DOCUMENT
Artyukhov, A.	3
Artyukhova, N.	3
Membrillo-HernÃ¡ndez, J.	3
Okulich-Kazarin, V.	3
Skowron, Å□.	3
Agostini, D.	2
Al Rashdi, H.	2
Caratozzolo, P.	2
Chans, G.M.	2
Elgeddawy, M.	2
FoÅ¡ner, A.	2
Glasserman-Morales, L.D.	2
Leal Filho, W.	2
Miranda, J.	2
Picasso, F.	2
RamÃrez-Montoya, M.S.	2
Salem, M.A.	2
WoÅ‚owiec, T.	2

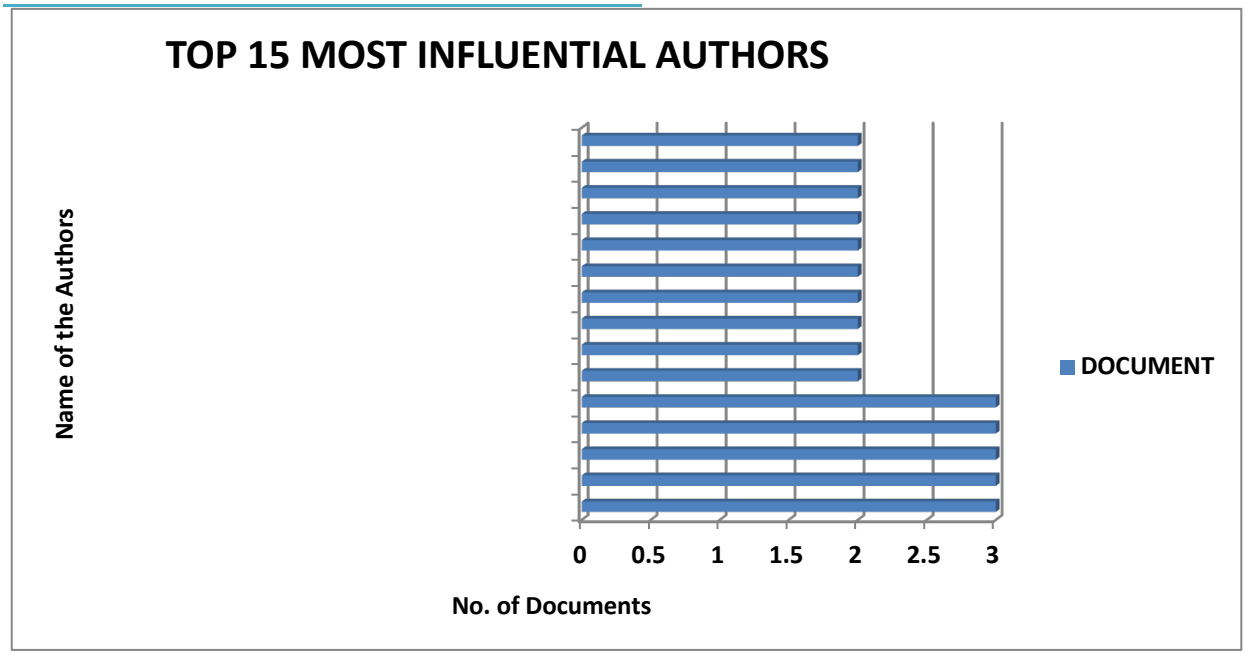


Fig 7: Extracted documents of top 15 most influential Authors
(Source: compiled by authors from Scopus Analysis's 2025)

Table 5 Data of Document type with no. of Documents

DOCUMENT TYPE S	NUMBER OF DOCUMENTS
Note	1
Book	2

Review	14
Book Chapter	23
Conference Paper	35
Article	95

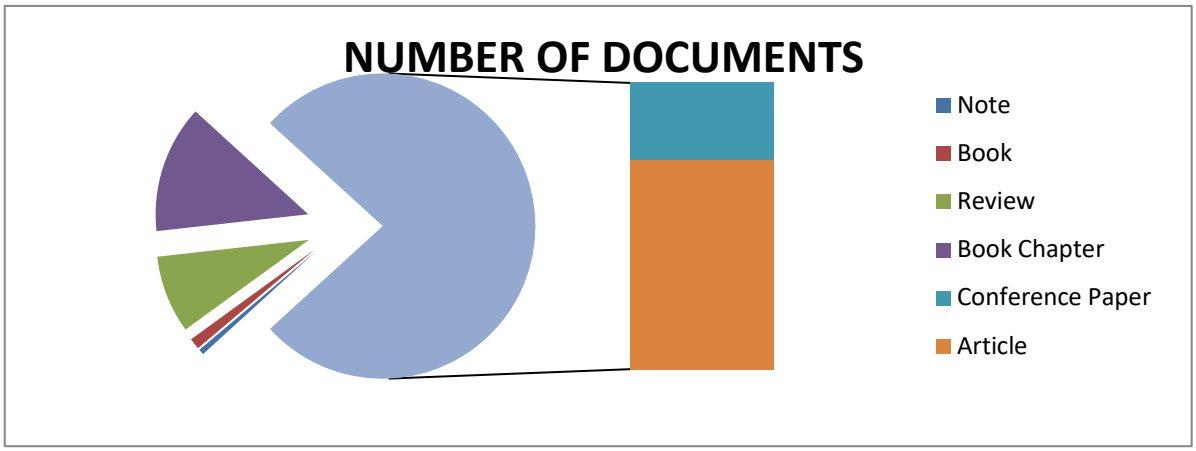


Fig 8: Extracted documents by Documents Type –Wise
(Source: compiled by authors from Scopus Analysis's 2025)

Table 6 : Year –Wise Data with Documents

YEAR	DOCUMENTS
2016	1
2018	1
2019	2
2020	6
2021	16
2022	29
2023	16
2024	56
2025	73

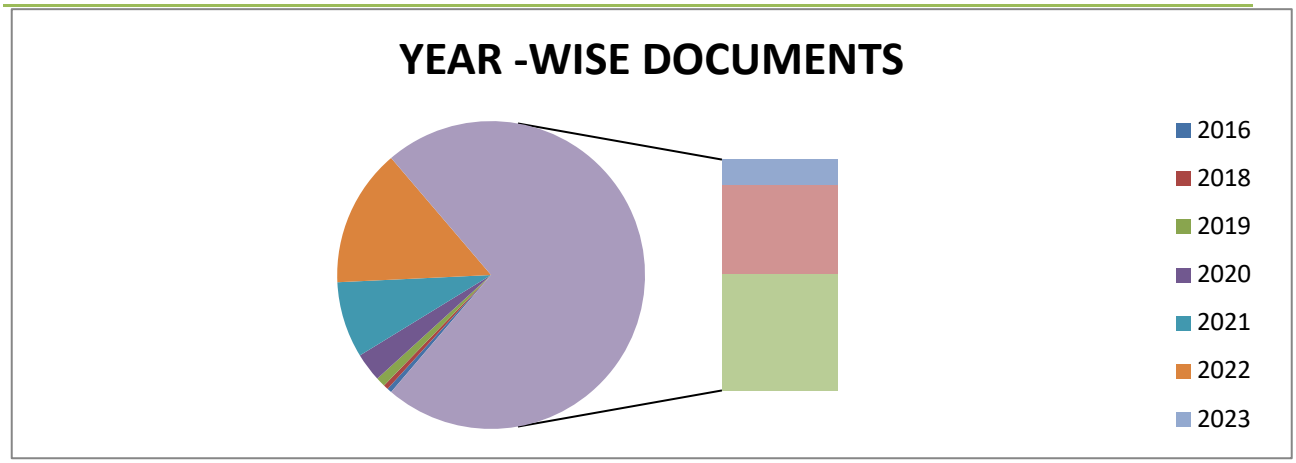
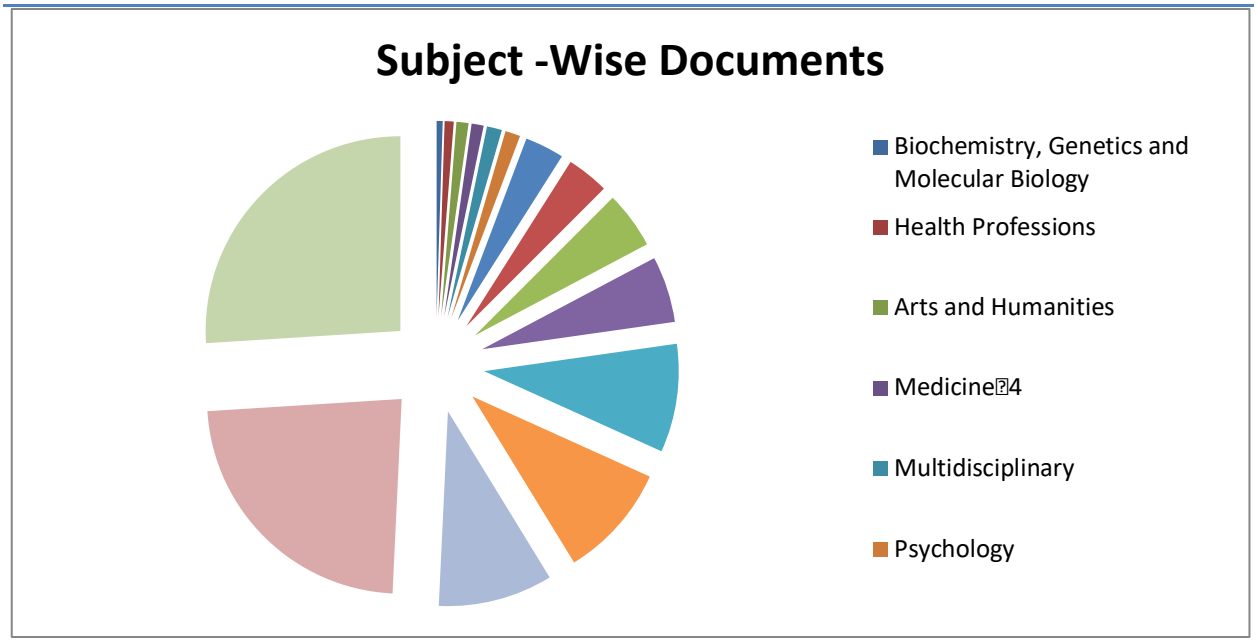


Fig: 9 Extracted documents by Year –wise
(Source: compiled by authors from Scopus Analysis's 2025)

Table 7 Data of Subject Area with no. of Documents

SUBJECT AREA	DOCUMENTS
Biochemistry, Genetics and Molecular Biology	2
Health Professions	3
Arts and Humanities	4
Medicine 4	4
Multidisciplinary	5
Psychology	5
Economics, Econometrics and Finance	13
Mathematics	14
Decision Sciences	19
Business, Management and Accounting	22
Engineering	36
Energy	38
Environmental Science	38
Computer Science	93
Social Sciences	104



Extracted documents by subject area
(Source: compiled by authors from Scopus Analysis's 2025)

5. Discussion

Generative artificial intelligence (AI) holds the potential to profoundly reshape the educational process by offering not only instant solutions and personalized content but also by actively fostering the development of metacognitive processes in students **(Hromada, 2024)**. These processes enhance students' ability to learn more effectively and independently solve complex problems, thereby contributing to deeper learning (Yang & Xia, 2023). Current research indicates that generative AI can adapt content to meet individual student needs while also modeling critical thinking and self-reflection processes essential for cultivating analytical skills and a deeper understanding of the curriculum (Loksa et al., 2022). The implementation of such AI systems can mitigate the risks of passivity and overreliance on technology, which are often associated with the misuse of automated solutions (Abdelghani et al., 2023). By providing

targeted support for metacognition and self-regulation, these AI systems can contribute to the creation of educational frameworks that promote autonomous learning and long-term academic benefits. This approach underscores the role of AI as an active facilitator of learning – one that not only adapts content but also equips students with tools to enhance their ability to learn effectively and critically reflect on their learning processes (Yang & Xia, 2023; Loksa et al., 2022). Moreover, the findings suggest that generative AI can significantly transform inclusive education through content personalization and multimodal approaches. These technologies enable the adaptation of educational materials to diverse learning styles and individual needs, MARKETING IDENTITY: HUMAN VS. ARTIFICIAL 769 thereby improving educational accessibility and fostering increased active participation in the learning process (Kadaruddin, 2023; Amresh, 2023). However, this issue raises the critical question of how inclusivity can extend beyond mere personalization to also address social and cultural diversity (Bernstein et al., 2020). Generative AI can serve as an effective tool for enhancing intercultural communication and fostering key skills that enable students to better understand diverse perspectives on selected issues. This process not only contributes to creating a more inclusive educational environment but also fosters its diversification and dynamism (Benmamoun, 2023). Such an educational approach has the potential to improve academic success while preparing students for life in a globalized, interconnected world, where empathy, cultural understanding, and effective interaction with diverse groups are critical (Farrelly & Baker, 2023). By integrating generative AI in this way, technology is synergistically connected with the development of social and emotional skills, establishing a framework for lifelong learning and active engagement in complex social contexts (Sharples, 2023). However, it is important to recognize that technologies, including AI, are not inherently neutral or objective – rather, their design and implementation are inevitably influenced by human values, preferences, and cultural contexts. Consequently, it is essential to analyze how a balanced integration of AI can support, rather than replace, human interaction and collaboration. Generative AI can act as a catalyst for interactive discussions in academic settings, with students using AI-generated data as a starting point for critical analysis and constructive argumentation (Creely & Blannin, 2023). This approach not only maximizes the potential for personal exchange but also enhances students' ability to critically engage with both academically relevant and societal issues (Sharples, 2023). The outcome is an improvement in their analytical and communication skills, which are essential for both their academic and professional development (Dron, 2023). The personalization of generative artificial intelligence (AI) represents a significant advancement in education; however, scholarly debate underscores the necessity for comprehensive ethical frameworks and regulatory measures to accompany these technologies. Generative AI systems should be developed with a focus on algorithmic transparency, enabling users to better understand the decision-making processes underlying AI-generated outputs (Chaudhry et al., 2022). Simultaneously, it is crucial to integrate clear mechanisms for feedback and evaluation in AI implementation, thereby facilitating greater control and ensuring the alignment of technologies with ethical standards (Holmes et al., 2021). Such an approach would not only allow students to engage with AI-generated content, but also actively involve them in the creation process, thereby enriching their educational experience with a critical dimension that fosters responsible technology use (Lin, 2023). This model of education transcends individual benefit and encourages students to view AI as a tool for broader societal advancement. An educational system that promotes a participatory form of AI-based learning can significantly enhance the development of critical thinking, civic responsibility, and a deeper understanding of the societal implications of technological progress. In this way, students would be prepared not only for complex professional challenges, but also for active participation in societal debates regarding the ethical use of technological innovations (Rusandi et al., 2023; Campos, 2023). A participatory educational approach not only addresses environmental and societal issues but also fosters collaboration and interdisciplinary thinking (de Sousa, 2021)**.**

6. Conclusion and Future Research Direction

This study aims to analyze the impact of generative artificial intelligence (AI) on higher education for Generation Z, with a focus on its potential to personalize learning processes, foster the development of critical thinking, and address the psychological dimensions of learning. Key findings suggest that generative AI offers significant advantages, such as enhancing student engagement and motivation through personalized content, while also supporting the development of analytical skills essential for navigating an informationsaturated environment (Farrelly & Baker, 2023). However, challenges have also emerged, including the potential overreliance on technology, which could undermine students'

ability to solve problems independently, as well as negative effects on social interactions and emotional well-being (Walczak & Cellary, 2023). The importance of these findings extends well beyond traditional educational methodologies, underscoring the need for a strategic integration of AI to ensure the balanced development of technical, cognitive, and social competencies. Research indicates that the successful implementation of generative AI has the potential to profoundly transform the education of Generation Z, but only if ethical concerns, privacy protection, and emotional well-being are adequately addressed (Kadaruddin, 2023). Despite the significant benefits offered by this technology, several limitations must be considered when interpreting the results of this study. Notably, the literature selection was confined to English and Slovak sources, and the analysis was constrained by the methodological frameworks of the studies reviewed. To gain a more comprehensive understanding of this issue, future research should incorporate larger and more diverse samples, alongside a more in-depth investigation into the practical applications of AI across different educational settings, as well as an assessment of its long-term psychological effects. Practical recommendations emerging from this study emphasize the development of educational strategies that integrate AI in ways that foster active learning, social interaction, and emotional intelligence. Generative AI should be viewed as a tool to enhance and support the educational process, rather than replace it. This approach can ensure the sustainable and holistic development of students, strengthening their capacity to navigate the challenges of contemporary society. Thus, the study contributes to the growing body of knowledge surrounding Generation Z education and underscores the necessity of a balanced approach to AI implementation – one that maximizes its benefits while mitigating potential risks. Ultimately, this study offers a broader framework for understanding the complex integration of generative AI in education and advocates for the responsible and effective use of this transformative technology, which holds the potential to become a pivotal element in reshaping the education system in the 21st century**.**

AI tools offer powerful avenues for advancing sustainable education, but their success depends on ethical deployment, inclusive access, and continuous evaluation. Bibliometric and SLR data underscore the urgency for interdisciplinary collaboration and policy innovation to harness AI's full potential in education.

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