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Review

SDG 4, Academic Integrity and Artificial Intelligence: Clash or Win-Win Cooperation?

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Abstract: This article investigates the relationship between Sustainable Development Goal 4 (SDG 4), academic integrity as its part, and artificial intelligence (AI) through a bibliometric analysis, assessing whether this intersection represents a clash or win-win cooperation. SDG 4 aims to ensure equitable access to quality education, while AI technologies have the potential to enhance educational practices but demote academic integrity. By analyzing a comprehensive body of the literature, this study identifies key trends and thematic areas where AI is applied in educational settings, particularly concerning maintaining academic integrity. The findings reveal a growing body of research highlighting AI's role in personalizing learning experiences, improving educational accessibility, and supporting educators' teaching methodologies. However, challenges such as ethical considerations, data privacy, and the digital divide are also addressed, indicating potential conflicts that need to be navigated. Ultimately, this analysis suggests that while there are significant opportunities for synergy between AI and SDG 4, the management of careful implementation and policy frameworks is essential to ensure that AI serves as a tool for promoting inclusive and sustainable education rather than exacerbating existing inequalities. AI transforms science management by enhancing data analysis, streamlining research processes, and improving decision-making, ultimately leading to more efficient and effective scientific research and innovation. The findings reveal that while AI can facilitate personalized learning and enhance educational accessibility, it also poses challenges related to academic misconduct, such as plagiarism and the misuse of AI-generated content. This duality highlights the need for educational institutions to develop robust frameworks that leverage AI's capabilities while safeguarding academic integrity. The article concludes that a collaborative approach, integrating AI into educational practices with a strong emphasis on ethical considerations and integrity, can lead to a synergistic relationship that supports the goals of SDG 4. Recommendations for future research and practical implications for managers, educators, scientists, and policymakers are also discussed, emphasizing the importance of fostering an educational environment that embraces innovation while upholding ethical standards.

Keywords: Sustainable Development Goal 4; artificial intelligence; academic integrity; bibliometric analysis; management in education and science

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1. Introduction

Sustainable Development Goal 4 (SDG 4) aims to ensure inclusive and equitable education and promote lifelong learning opportunities, recognizing education as a fundamental human right and a cornerstone for sustainable development. Adopted as part of the United Nations 2030 Agenda for Sustainable Development, SDG 4 encompasses ten specific targets that address various aspects of educational quality, accessibility, and equity, including

the need to eliminate gender disparities, ensure universal access to quality pre-primary education, and promote skills for employment [1]. The goal underscores the importance of education in fostering economic growth, social cohesion, and environmental sustainability, thereby positioning it as a critical enabler for achieving other Sustainable Development Goals (SDGs) [2].

Despite significant progress in expanding access to education globally, substantial challenges remain. According to recent reports, approximately 262 million children and youth are still out of school, and many enrolled do not meet minimum proficiency standards in crucial subjects such as reading and mathematics [3]. These disparities are often exacerbated by socioeconomic factors, geographical barriers, and systemic inequalities, highlighting the urgent need for targeted interventions to ensure no one is left behind [4]. Furthermore, the COVID-19 pandemic has intensified existing challenges, disrupting educational systems and exacerbating inequalities, necessitating a renewed focus on resilient and adaptive educational strategies [5].

Integrating innovative technologies, particularly artificial intelligence (AI), has emerged as a promising avenue for enhancing educational quality and accessibility. AI has the potential to personalize learning experiences, improve resource allocation, and facilitate data-driven decision-making in educational settings [6]. However, implementing AI in education also raises ethical concerns regarding data privacy, algorithmic bias, and the digital divide, which must be carefully navigated to ensure equitable outcomes [7,8].

The sphere of education has been evidenced to be one in which the most dynamic changes occur due to digital [9,10] and socioeconomic transformations [11,12].

In recent years, artificial intelligence technologies have proved their effectiveness in comparison to other methods of data analysis [13,14]. They have been applied in a variety of contexts, particularly in the enhancement of educational and research processes [15], the creation of a shared virtual business environment [16], and the analysis of large-scale data sets with a focus on customer or financial data [17,18]. In addition, AI has been employed in detecting high-risk financial transactions [19,20], medical diagnostics, developing HealthTech, and enhancing healthcare cybersecurity [21–23].

A bibliometric analysis approach comprehensively investigates the dominant trends in intersectoral research [24–31].

As the data from the above literature sources show, the relationship between SDG 4, AI, and the ethical challenges of its implementation (academic integrity) is close. However, whether this relationship leads to a clash or win-win cooperation is worth asking. It is necessary to conduct a bibliometric analysis to answer this question and further develop effective recommendations for the successful "coexistence" of AI and academic integrity. The bibliometric analysis should show the patterns of studying the functioning of AI in the context of academic integrity, the quality of educational and scientific activities, and management recommendations for universities and scientific organizations.

The authors of this article made the first attempts to find the relationship between the quality of education and the Sustainable Development Goals [32,33], modeled an information learning system with quality control parameters [34], and studied some aspects of student interaction with AI [35,36]. These studies require further generalization to obtain a holistic picture of the prospects for using AI regarding the quality of education, the effectiveness of management decisions, and academic integrity.

So, we were able to formulate research objectives and hypotheses.

Research Objectives:

1. To investigate the current state of research on the intersection of SDG 4, AI, and academic integrity;
2. To identify the key trends and patterns in studies examining the impact of AI on educational quality, accessibility, and equity while considering ethical implications;
3. To assess the potential benefits and challenges of AI implementation in educational settings, with a particular focus on academic integrity;

4. To develop evidence-based recommendations for policymakers, educators, and researchers to ensure the ethical and effective use of AI in education, contributing to the achievement of SDG 4.

Hypotheses

Hypothesis 1. *The implementation of AI in education has the potential to significantly enhance educational quality, accessibility, and equity, contributing to the achievement of SDG 4;*

Hypothesis 2. *The ethical challenges associated with AI in education, such as academic integrity, data privacy, algorithmic bias, and the digital divide, can hinder the effective implementation of AI and negatively impact educational outcomes;*

Hypothesis 3. *A collaborative approach, integrating AI into educational practices with a strong emphasis on ethical considerations and integrity, can lead to a synergistic relationship that supports the goals of SDG 4.*

2. Materials and Methods

The relationship in the chain "SDG 4–quality of education–academic integrity–AI" was studied as follows.

Method: bibliometric analysis of the content of scientific articles.
Database: Scopus (https://www.scopus.com/, accessed on 1 September 2024).
Bibliometric analysis tools: (1) VOSviewer v. 1.6.19 (https://www.vosviewer.com/, accessed on 1 September 2024, open access software); (2) SciVal (https://www.scival.com/, accessed on 1 September 2024, built-in Scopus database tool).

The architecture of the bibliometric analysis is presented in Figure 1.

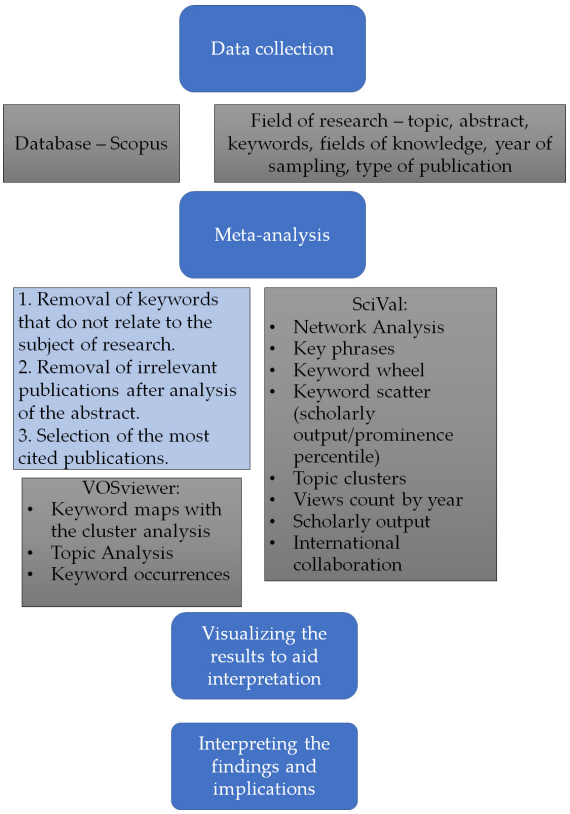


Figure 1. Bibliometric analysis architecture.

The sequence of keywords (queries):

- Stage 1. SDG 4;

- Stage 2. Quality of education;
- Stage 3. Integrity+: "academic integrity" OR "research integrity" OR "education* ethics" OR "scientific ethics" AND (LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2024)) AND (LIMIT-TO (DOCTYPE, "ar")) AND (EXCLUDE (SUBJAREA, "MEDI") OR EXCLUDE (SUBJAREA, "PSYC") OR EXCLUDE (SUBJAREA, "NURS") OR EXCLUDE (SUBJAREA, "BIOC") OR EXCLUDE (SUBJAREA, "HEAL") OR EXCLUDE (SUBJAREA, "VETE") OR EXCLUDE (SUBJAREA, "DENT") OR EXCLUDE (SUBJAREA, "IMMU") OR EXCLUDE (SUBJAREA, "NEUR") OR EXCLUDE (SUBJAREA, "PHAR")).

The key query "artificial intelligence" was not implemented because, at the stage of query processing under stage 3, keywords and phrases related to AI were found in the search results.

Types of reports by key queries:

- Stage 1—keyword wheel;
- Stage 2—keyword map with cluster analysis;
- Stage 3—Keyword maps with cluster analysis, topic analysis, keyword occurrences, network analysis, key phrases, keyword wheel, keyword scatter (scholarly output/prominence percentile), topic clusters, views count by year, scholarly output, international collaboration, top 20 article keyword analysis.

3. Results

Stage 1.

Tool for analysis: SciVal.
Number of articles for analysis: 17,458.
Time frame: 2019–2024 (August 30).
Subject area: all.
Total number of keywords: 5726.
Frame of keywords for analysis: top 1% by prominence.

This study aimed to find the relationship between SDG 4, quality of education, academic integrity, and AI.

The results of the bibliometric analysis at this stage (Figure 2) allowed us to establish the following patterns:

1. Among the most popular topics within the framework of studying SDG 4 were higher education and its quality, information technology, innovation, various learning models, artificial intelligence, and ethics of the educational process.

2. Cluster T.1855.

This topic cluster reflects the increasing convergence of Big Data, AI, and Social Media, emphasizing their collective importance in modern computational research. The cluster's position near the boundary with other segments suggests strong interdisciplinary connections, possibly with Business (BUSI) or Social Sciences (SOC).

3. Cluster T.5.

This cluster focuses on the role of technology in facilitating knowledge exchange and management. The proximity to Business suggests its relevance to corporate and organizational studies, highlighting how information technology supports strategic decision-making and operational efficiency.

4. Cluster T.22918.

This cluster underscores the core areas of AI research, particularly in decision-making and machine learning. The dense clustering in this area suggests a significant volume of research and innovation, likely reflecting AI's central role in modern technological advancements.

5. Cluster T.1075.

This cluster likely explores the dynamics of innovation, particularly in the context of engineering and material sciences. Open innovation is a critical concept in R&D, indicating collaborative and cross-disciplinary approaches to developing new technologies.

6. Cluster T.306.

This topic cluster highlights the growing field of online education, particularly as it intersects with technology. The research in this area examines the effectiveness of online learning platforms, instructional technologies, and the pedagogical implications of digital education.

7. Cluster T.818.

This cluster explores the integration of sustainable practices within higher education institutions. The research may focus on how universities and educational bodies can contribute to broader sustainability goals.2

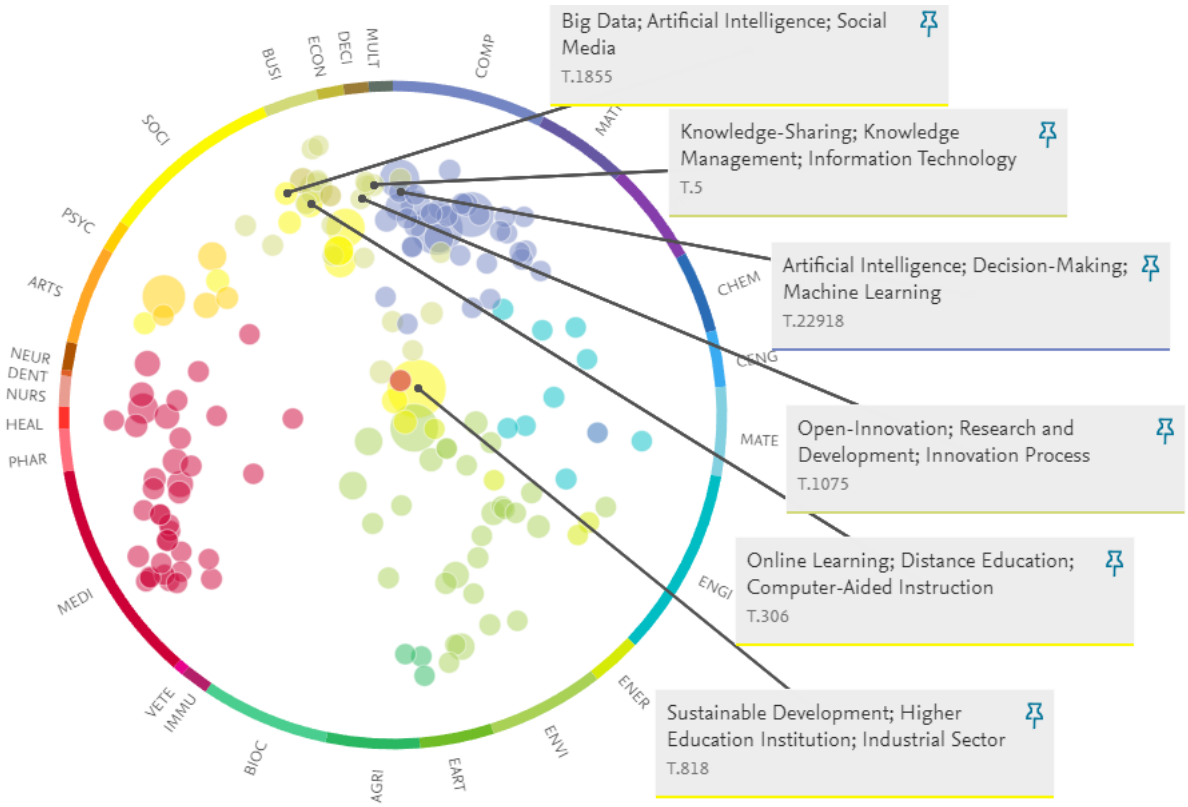


Figure 2. The keyword wheel on the query "SDG 4" (by SciVal).

Thus, the connection between the key themes was established, which allowed us to move on to the next stage of the bibliometric analysis and continue examining the chain at the "quality of education" stage.

Stage 2.

Tool for analysis: VOSviewer
Number of articles for analysis: 7195.
Time frame: 2022–2024 (August 30).
Subject area: all.
Total number of keywords: 22,005.
Frame of keywords for analysis: minimum 14 occurrences (537 keywords, top 2%).

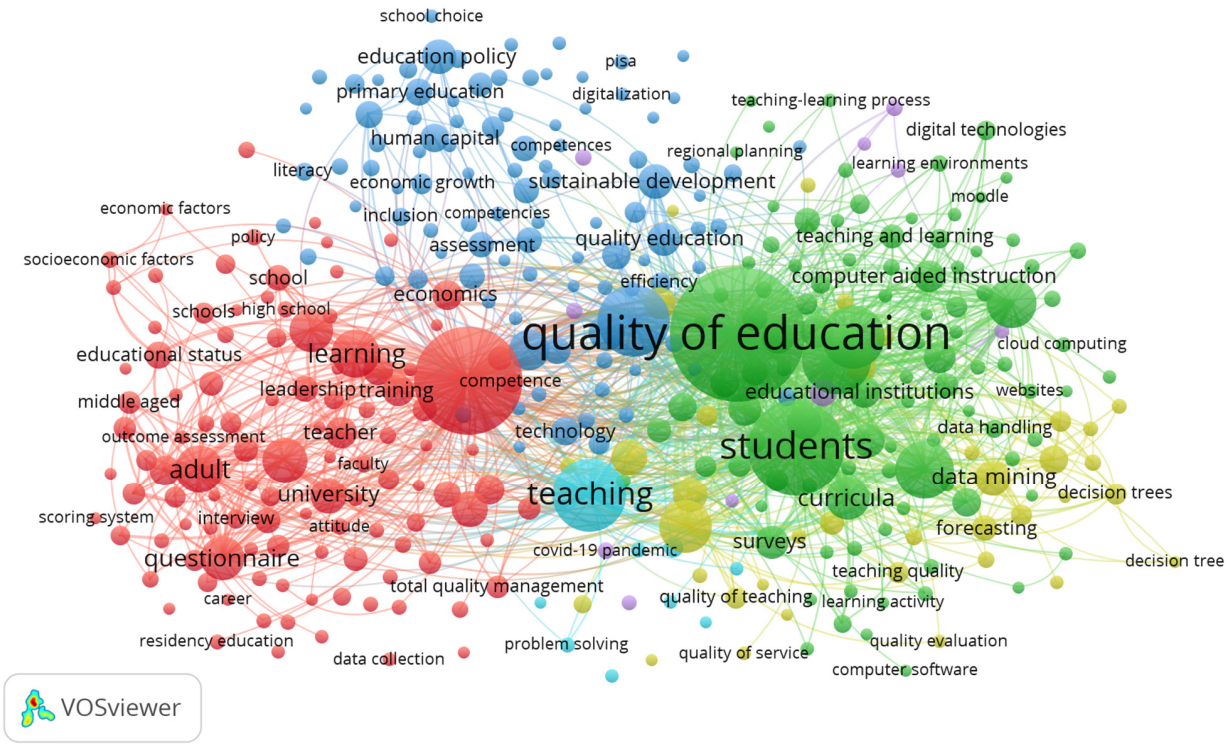
Purpose of study: finding the relationship between quality of education, academic integrity, and AI.

The results of the bibliometric analysis are presented in Figure 3. The keyword map, as well as the key cluster, gave a clear idea that the problem of education quality has

significantly "digitized" in the last three years since ChatGPT was made publicly available in November 2022. Other key topics that were considered in the context of education quality continue to be sustainable development and decision-making processes. The latter topic takes on new significance for the management of universities, teachers, and students in the context of AI's possible participation in this process. Although the keyword "education policy" was among the leaders, it was at the end of the list in the top 2%. The above assumptions were confirmed by the list of leading keywords in the results of the bibliometric analysis (Table 1). In parallel with the study of the AI phenomenon and its impact on the quality of education, new challenges have emerged related to the ethical aspects of ensuring the quality of education in the context of the active "implementation" of AI in universities.

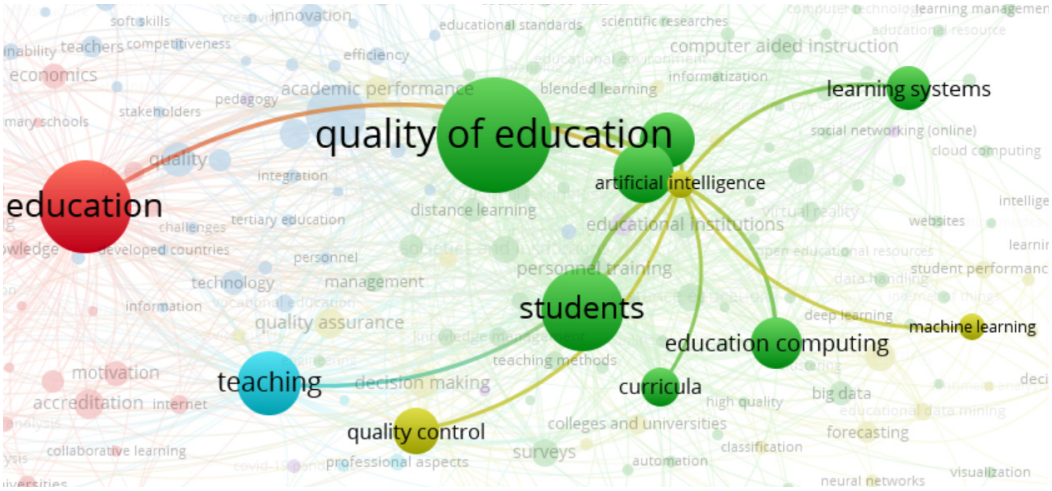
Table 1. List of keywords on the query "quality of education".

Keyword (Key Phrase)	Number of Occurrences
Higher education	497
Sustainable development + SDGs + sustainability	188
Quality assurance	130
University	122
Decision making	116
Artificial intelligence + intelligent systems	108
Information technology	80
Culture	26
Ethics	15
Education policy	14



(a)

Figure 3. *Cont.*



(**b**)

Figure 3. The keyword map on the query "quality of education": general map (**a**) and (**b**) cluster "artificial intelligence" (by VOSviewer).

It should be noted that the speed of AI implementation in the educational process, for example, the emergence of new courses and university and state policies, lags behind the actual speed of "implementation" and mastering of AI by education stakeholders, particularly students. Thus, due to the difference in these speeds, a three-way conflict arises between the university management, teachers, and students. This conflict is due to the lack of rules for using AI in the educational process. The consequence of this conflict may be violations of academic integrity when implementing AI.

Thus, in stage 3 of the research, the degree of relationship between academic integrity and artificial intelligence and the prospects for the "interaction" of these two phenomena in the context of ensuring the quality of education should be determined.

Stage 3.

Tool for analysis: VOSviewer and SciVal
Number of articles for analysis: 3303.
Time frame: 2022–2024 (August 30).
Subject area: all, except medicine-related topics.
Total number of keywords: 11,645.
Frame of keywords for analysis: minimum 15 occurrences (154 keywords, top 1.5%).

Before analyzing the results at this stage, the authors want to voice a spoiler: we did not need the fourth stage of bibliometric analysis, which would have considered the AI phenomenon in the context of its connection with academic honesty and other keywords. We received detailed answers already at stage 3 because it presented us with an unexpected (although predictable in our thoughts) result: the study of academic honesty in 2022–2024 is inextricably linked with introducing AI into the educational process.

The keyword map for 2022–2024 has two key nodes: higher education and AI (Figure 4). This map alone suggests that the ethical aspects of education during this period are inextricably linked with AI. However, this map may give an erroneous idea of the progress in the study of AI in the context of ensuring academic honesty. The authors received keyword maps separately each year to obtain an objective picture of keywords in this period. The keyword map for 2022 demonstrates exclusively various contexts of academic honesty and is not related to AI. The article's authors do not provide this map as one of no interest. The absence of AI or its derivatives (for example, large language model) among the top 1.5% of keywords is logical since these keywords appeared only in November 2022 and did not have time to enter the leaders quantitatively in two months of this year. In 2023 and 2024, AI took the leading positions among keywords (Figures 5 and 6). At the same time, the authors noted an interesting feature: in 2023, the topic of academic honesty

was discussed in conjunction with ChatGPT, and in 2024, it was already in conjunction with AI in general. Thus, understanding the need to write rules of the game (policies) for using AI has taken on broader horizons.

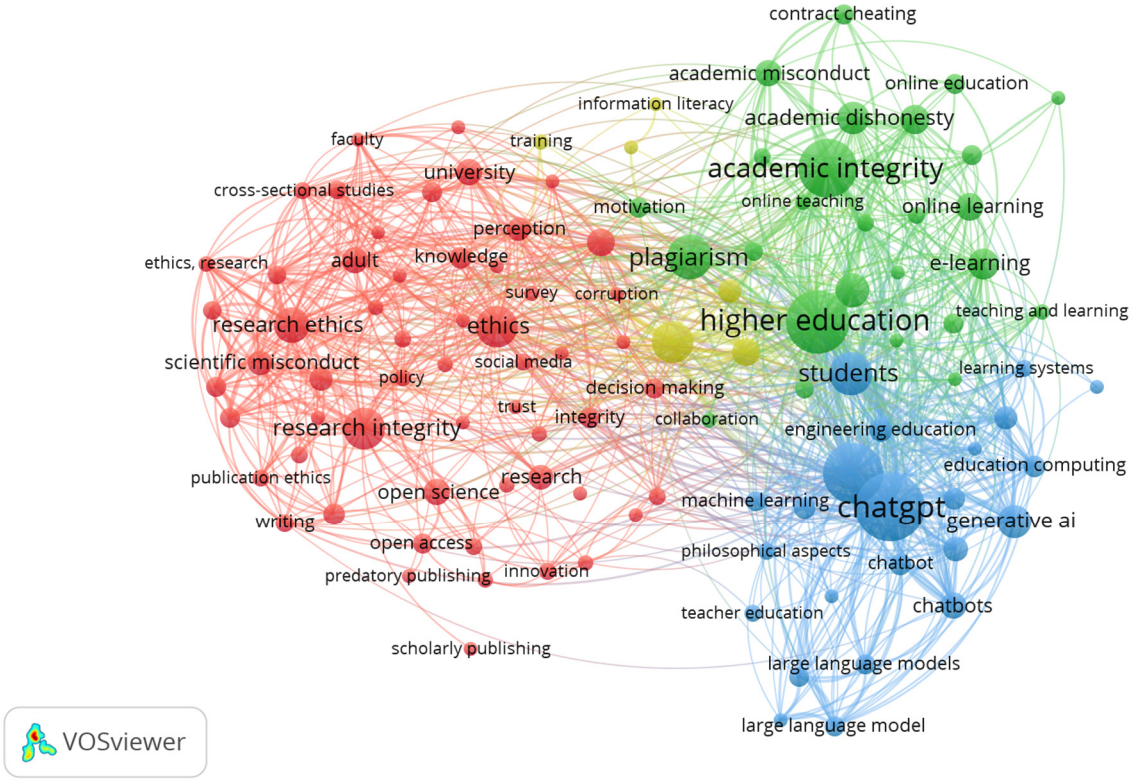


Figure 4. The keyword map on the query "integrity+" (2022–2024) (by VOSviewer).

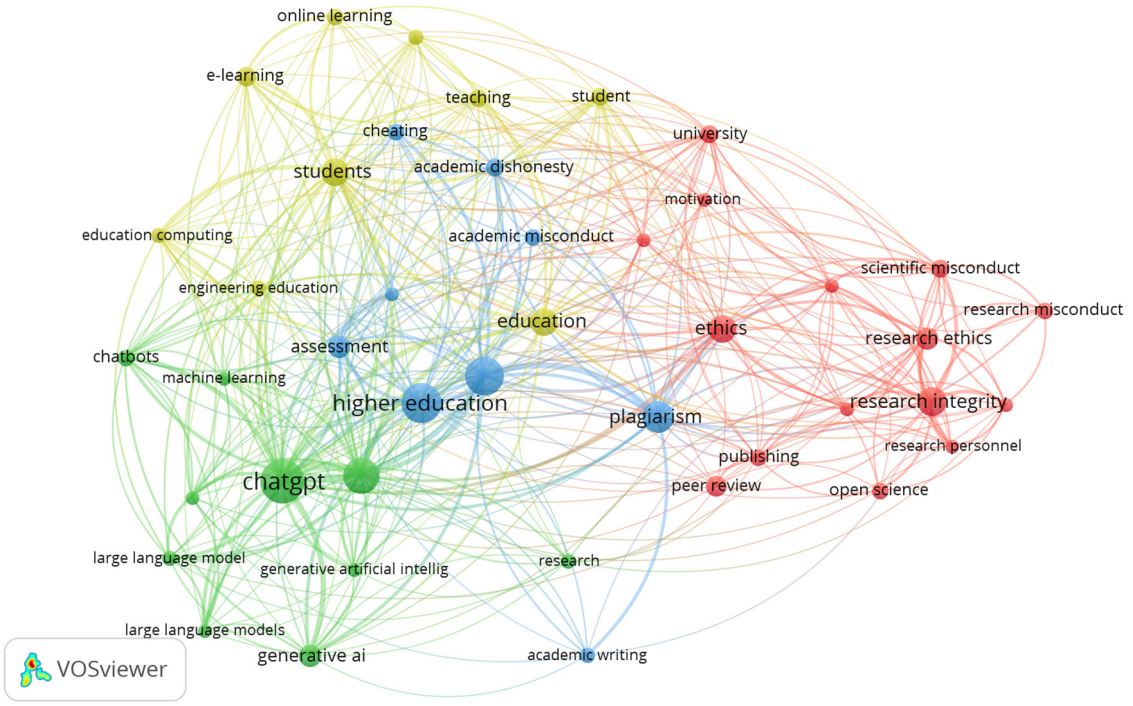


Figure 5. The keyword map on the query "integrity+" (2023) (by VOSviewer).

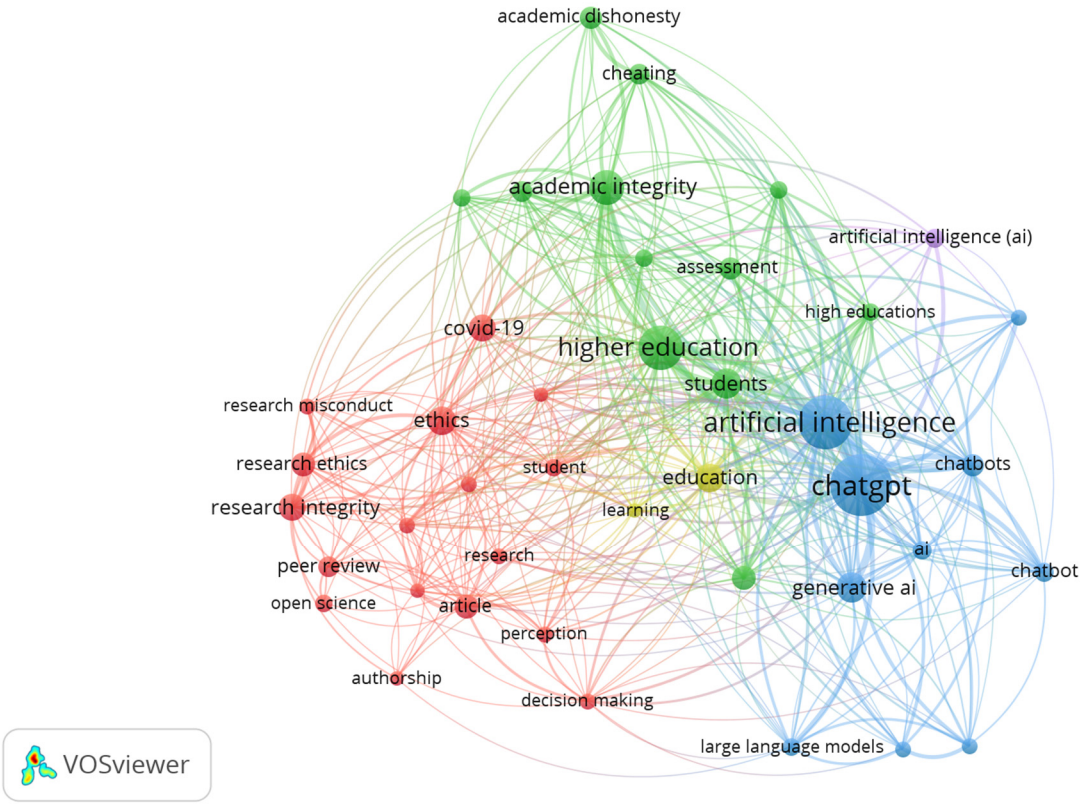


Figure 6. The keyword map on the query "integrity+" (2024) (by VOSviewer).

The key cluster "artificial intelligence" (Figures 7 and 8) has also changed, with more AI tools appearing in 2024. However, the authors found the keywords linking AI, academic integrity, and the development of AI implementation policies in the university's management and educational process at the very "bottom" of the keyword list (Figure 9).

The progress in studying AI in the context of academic integrity can be clearly demonstrated using Table 2, which lists the leading keywords in 2023 and 2024. The leadership of keywords related to AI in the "integrity+" search is also confirmed by SciVal data in the leading keyword phrases (Figure 10).

A separate element of the bibliometric analysis is data on the prominence of popular topics on education and AI in the context of ensuring academic integrity. As the data in Figure 11 and Table 3 show, all AI-related topics have significantly increased in their weight in 2022–2023. This means that studying the strategy of "interaction" between AI and the principles of academic integrity in the future should lead to effective policies for using AI in the academy.

Table 2. List of keywords on the query "integrity+" which are related to AI.

Keyword (Key Phrase)	Number of Occurrences (2022)	Number of Occurrences (2023)	Number of Occurrences (2024)
ChatGPT	-	142	232
Artificial intelligence	-	111	219
Generative artificial intelligence	-	50	94
Large language model	-	48	51

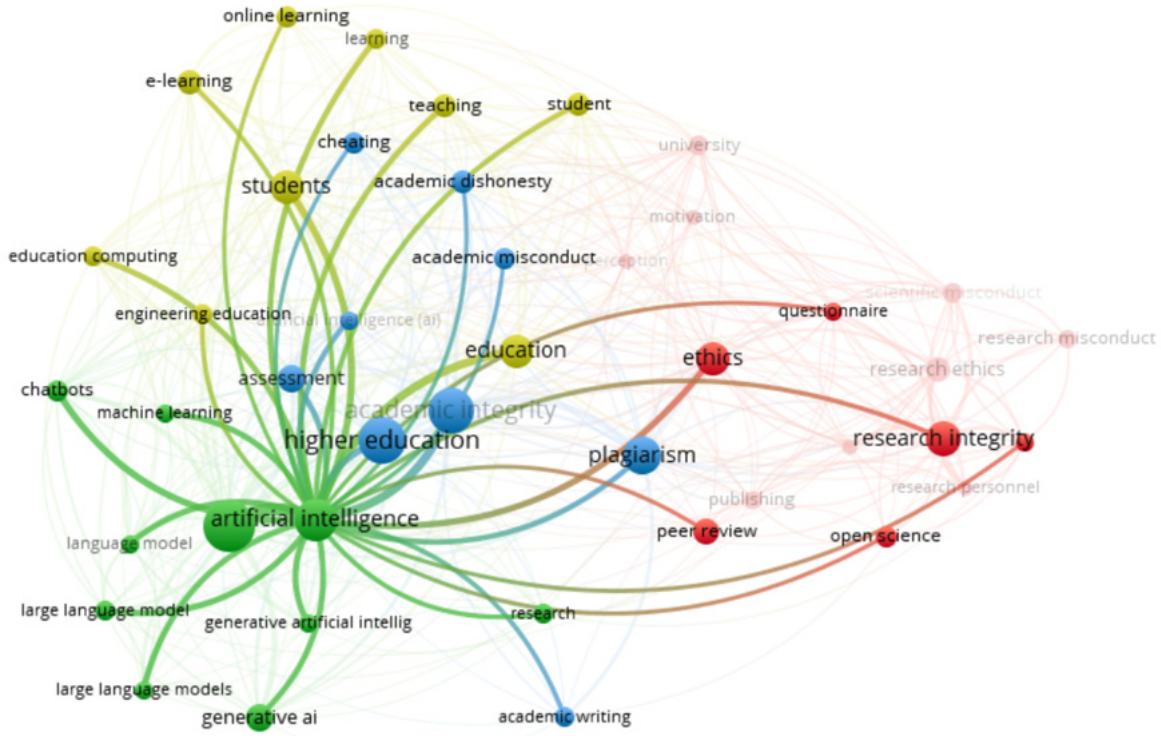


Figure 7. The key cluster on the query "integrity+" (2023) (by VOSviewer).

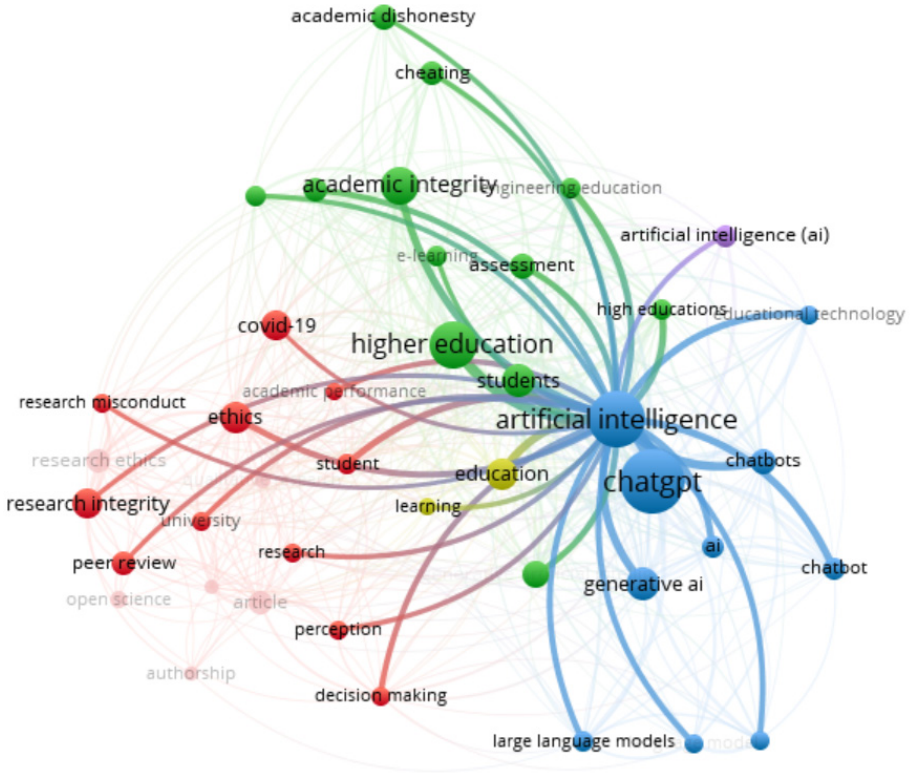


Figure 8. The key cluster on the query "integrity+" (2024) (by VOSviewer).

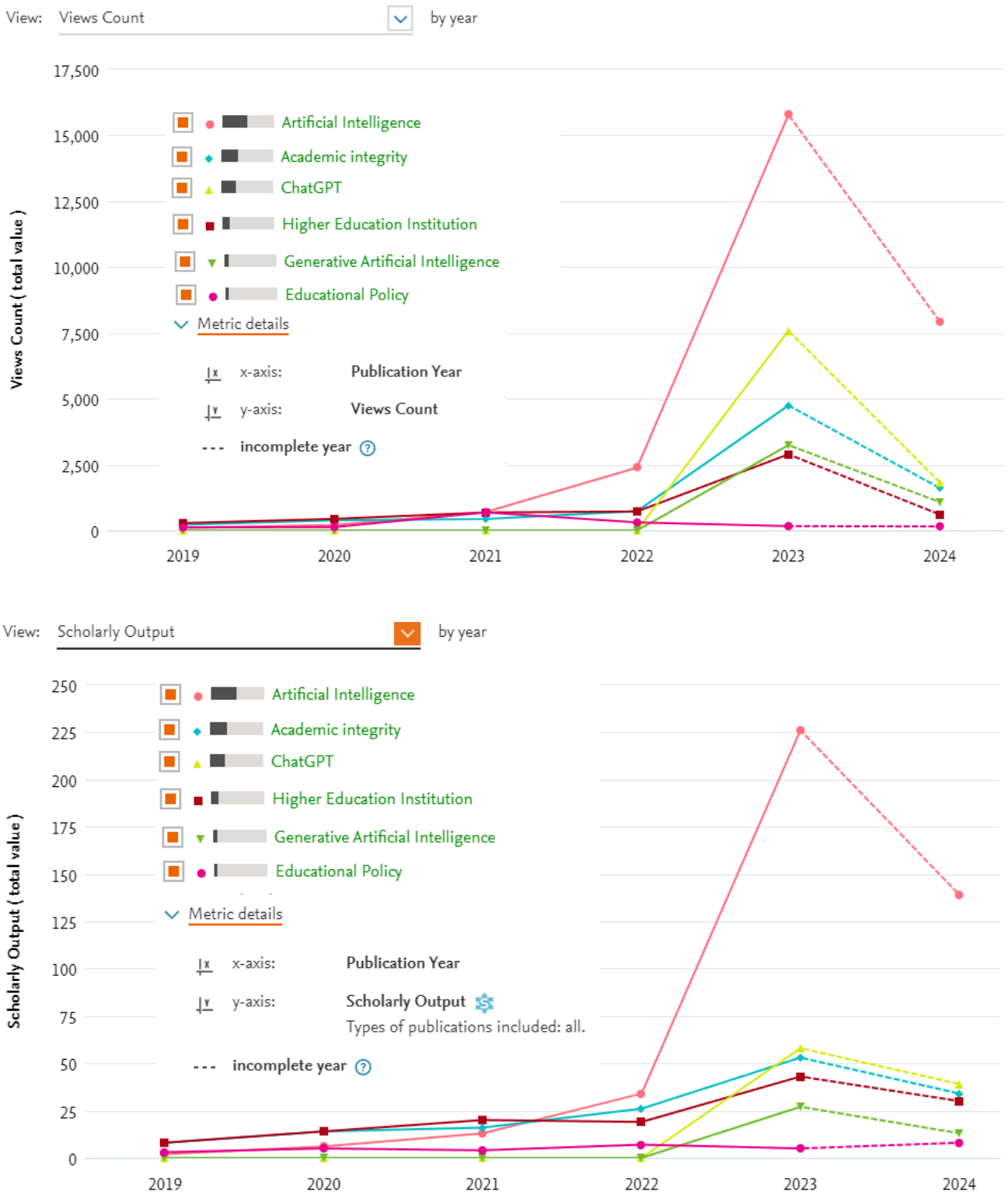


Figure 9. Metrics on the query "integrity+" (2019–2024) (by SciVal).

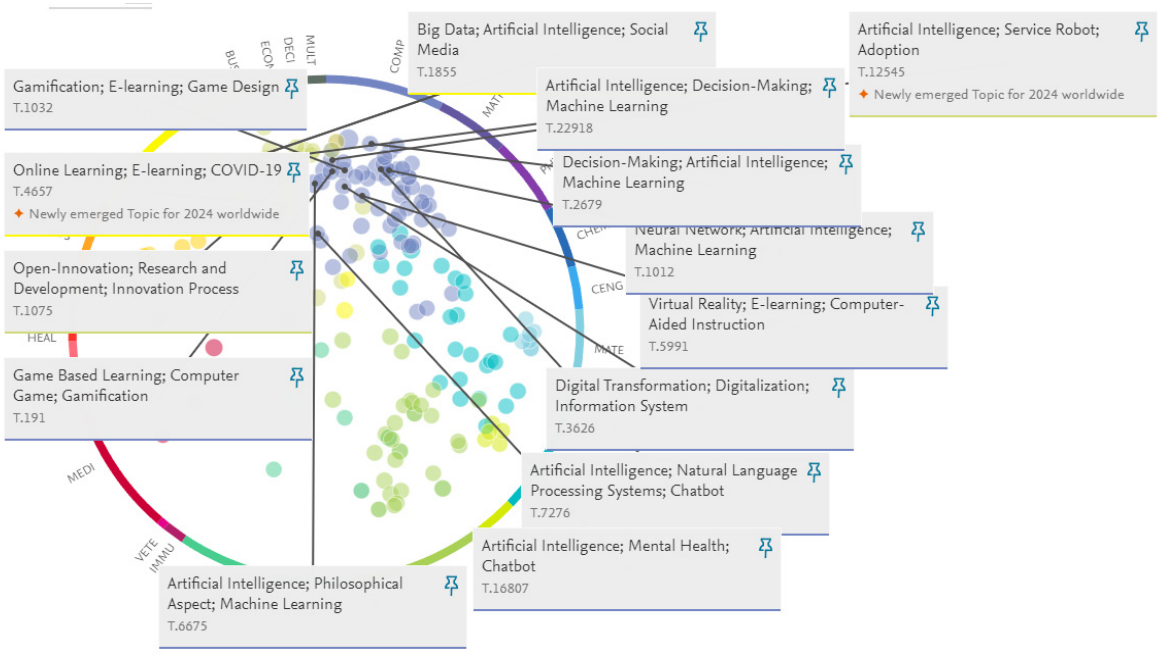
View: Scholarly Output (growth, %) by year

Keyphrase	2019	2020	2021	2022	2023	2024	2019-2024
Artificial Intelligence	-	+200.0	+116.7	+161.5	+567.6	-15.9	+11,250.0
Research Integrity	-	+71.4	-16.7	+40.0	+1,807.1	-65.5	+3,714.3
Plagiarism	-	-5.8	+22.4	-15.0	+58.8	+21.0	+55.8
Academic integrity	-	+75.0	+14.3	+68.8	+100.0	-25.9	+575.0
ChatGPT	-	-	-	-	+20.8	+3.4	-
Large Language Model	-	-	-	+100.0	+1,250.0	+63.0	-

View: Views Count (growth, %) by year

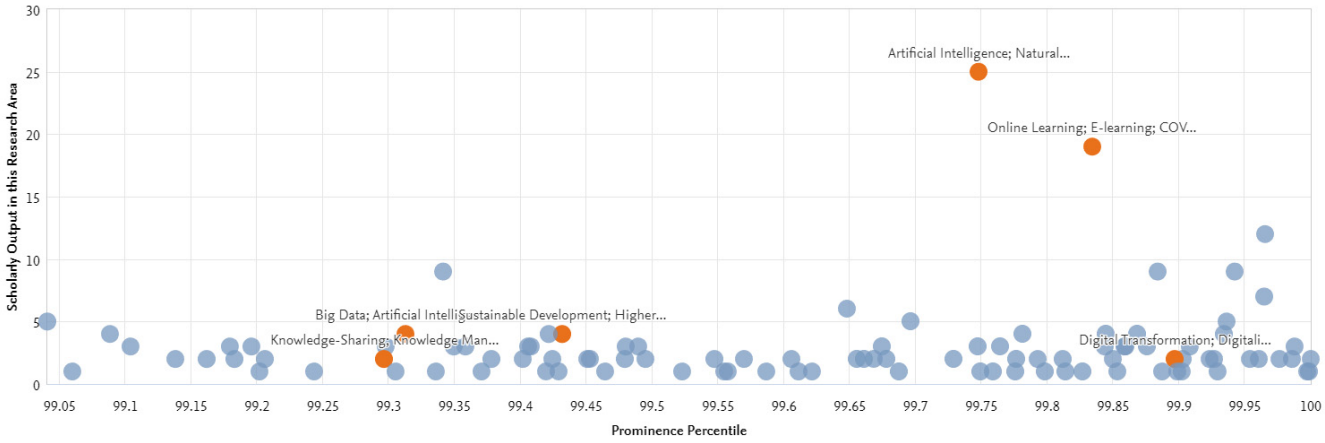
Keyphrase	2019	2020	2021	2022	2023	2024	2019-2024
Artificial Intelligence	-	+106.0	+245.1	+238.7	+578.7	-41.9	+16,242.0
Research Integrity	-	+60.3	-38.7	-0.6	+417.6	-81.7	+405.7
Plagiarism	-	-30.6	+25.1	+0.4	+161.1	-35.3	+127.8
Academic integrity	-	+80.2	+13.0	+67.6	+563.6	-63.7	+2,165.9
ChatGPT	-	-	-	-	+243.4	-70.3	-
Large Language Model	-	-	-	-95.2	+6,743.1	-74.4	-

Figure 10. Metrics of key phrases on the query "integrity+" (2019–2024) (by SciVal).



(a)

Figure 11. *Cont.*



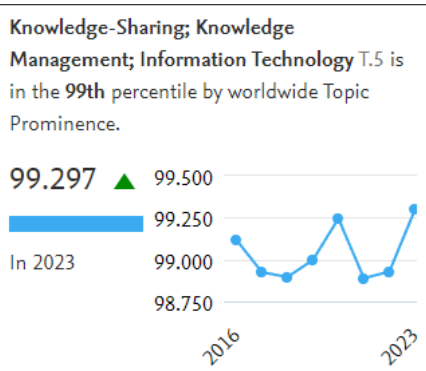
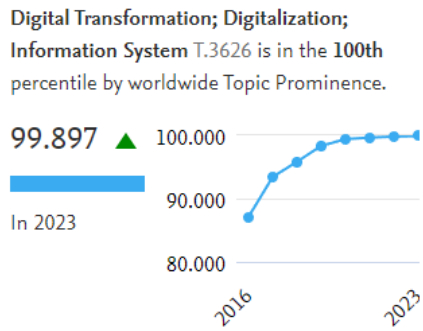
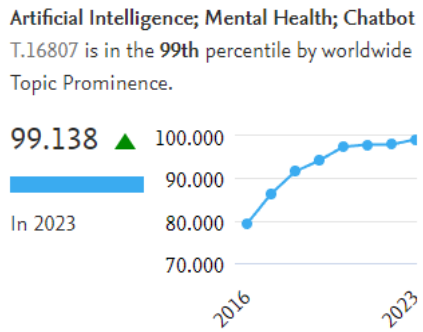
(**b**)

Figure 11. Wheel (**a**) and scatter (**b**) with key topics on the query "integrity+" (2019–2024) (by SciVal).

Table 3. Topic clusters on the query "integrity+" (illustrations–screenshots from SciVal).

Topic Cluster	Prominence Percentile, Progress
Artificial Intelligence; Natural Language Processing Systems; Chatbot	**Artificial Intelligence; Natural Language Processing Systems; Chatbot** T.7276 is in the **100th** percentile by worldwide Topic Prominence. 99.748 ▲ In 2023 100.000 80.000 60.000 2016 2023
Sustainable Development; Higher Education Institution; Industrial Sector	**Sustainable Development; Higher Education Institution; Industrial Sector** T.818 is in the **99th** percentile by worldwide Topic Prominence. 99.432 ▲ In 2023 100.000 98.000 96.000 2016 2023
Big Data; Artificial Intelligence; Social Media	**Big Data; Artificial Intelligence; Social Media** T.1855 is in the **99th** percentile by worldwide Topic Prominence. 99.313 ▲ In 2023 100.000 98.000 96.000 2016 2023

Table 3. *Cont.*

Topic Cluster	Prominence Percentile, Progress
Knowledge-Sharing; Knowledge Management; Information Technology	
Digital Transformation; Digitalization; Information System	
Artificial Intelligence; Mental Health; Chatbot	

1. Generalizations.

1.1 Dominance of AI. AI and its various applications (e.g., decision-making, machine learning, natural language processing, mental health, and service robots) are prominently featured across multiple disciplines. This fact indicates that AI is a central and rapidly expanding area of research, influencing a wide range of fields, from healthcare to education and beyond.

1.2 Integration of technology in education. Topics like e-learning, online learning, game-based learning, and gamification suggest a strong trend toward integrating technology into educational practices. The focus on these topics highlights the ongoing transformation in how education is delivered and experienced, driven by digital tools and platforms.

1.3 Emergence of new research areas. The wheel identifies newly emerging topics for 2024, such as AI in Service Robots and the adoption of AI in various sectors. These emerging areas signal the future research directions and the increasing importance of AI in everyday applications and industries.

1.4 Cross-disciplinary research. Many of the highlighted topics lie at the intersection of multiple disciplines, such as AI's impact on social media, mental health, and educational

technology. This cross-disciplinary nature emphasizes the interconnectedness of modern research, where technological advancements influence various domains simultaneously.

2. Prospectives.

2.1 Continued expansion of AI research. We can expect further diversification and specialization within AI-related research as AI continues to evolve. This fact will likely include more focus on practical applications, ethical considerations, and the integration of AI into various sectors like healthcare, education, and industry.

2.2 Growth in digital education. The digital and online learning trend, accelerated by the COVID-19 pandemic, will likely continue to grow. This area may see innovations in how education is gamified, personalized, and delivered remotely, with an increasing emphasis on making learning more interactive and accessible.

2.3 Emerging technologies and their adoption. Identifying newly emerging topics, such as AI-driven service robots, indicates future research will likely focus on how these technologies are adopted in real-world settings. This outcome suggests a forthcoming emphasis on practical implementation, user acceptance, and the societal impact of these technologies.

2.4 Interdisciplinary collaborations. The overlap between different research areas indicates a future where interdisciplinary collaborations will be crucial. Researchers must work across traditional boundaries to address complex problems, combining insights from AI, education, social sciences, and more.

Which articles are the most cited for the query "integrity+"? The authors analyzed the top twenty articles and their keywords. A total of 17(!) of the 20 articles are devoted to AI and have corresponding keywords (Table 4).

Table 4. Authors' keywords from the TOP 20 articles "cited by" on the query "integrity+".

Year	Source	Author Keywords
2023	Rudolph et al. [37]	Artificial Intelligence (AI); Artificial Intelligence in Education (AIEd); assessment; ChatGPT; Generative Pre-trained Transformer 3 (GPT-3); higher education; learning & teaching; natural language processing (NLP)
2024	Cotton et al. [38]	detection and prevention; higher education; Machine-generated writing; plagiarism
2023	Lim et al. [39]	Academic integrity; Bard; ChatGPT; Critical analysis; DALL-E; Education; Educator; Ethics; Future of education; Generative AI; Generative artificial intelligence; Google; Management education; Management educator; OpenAI; Paradox; Paradox theory; Ragnarök; Reformation; Transformation; Transformative education
2024	Farrokhnia et al. [40]	Artificial intelligence; ChatGPT; educational technologies; higher education; SWOT analysis
2023	Rudolph et al. [41]	Artificial intelligence (AI); assessment; Bard; Bing Chat; chatbots in higher education; ChatGPT; conversational agents; Ernie; generative pre-trained transformers (GPT); higher education; large language models (LLMs); learning & teaching
2023	Wu et al. [42]	AIGC; ChatGPT; GPT-3; GPT-4; human feedback; large language models
2023	Rahman [43]	AI for code; artificial intelligence; ChatGPT; ChatGPT survey; educational technology; GPT-3; GPT-4; large language model; programming education; research
2023	Perkins [44]	Artificial Intelligence; ChatGPT; GPT-3; Large Language Models; plagiarism
2023	Crawford et al. [45]	Academic Integrity; Artificial Intelligence; Chatgpt; Large Language Model; openai; student character
2023	Sullivan et al. [46]	Academic integrity; artificial intelligence; ChatGPT; equity; higher education; student learning
2023	Chan [47]	AI policy framework; Artificial intelligence; Assessment; ChatGPT; Ethics
2023	Strzelecki [48]	ChatGPT; higher education; technology acceptance
2023	Yan [49]	AI-enhanced education; Automatic text generation; ChatGPT; Plagiarism; Technology-enhanced writing
2023	Eke [50]	Academic integrity; ChatGPT; Generative AI; Large language models; OpenAI
2023	Shoufan [51]	ChatGPT; education; students- perceptions
2023	Javaid et al. [52]	Artificial Intelligence; ChatGPT; Education; Learning; Students; Teaching
2022	Holmes [53]	Artificial Intelligence (AI); AI in education and learning (AIED)

Let's analyze this table in more detail.

1. Key topics.

1.1 Artificial intelligence and education.

AI's role in education, particularly in assessment, learning, teaching, and the broader impacts on higher education, is a recurring theme across multiple sources. The consistent mention of *AI in education (AIED)* and *learning & teaching* suggests a deepening exploration of how AI can enhance or disrupt traditional educational practices.

1.2 ChatGPT and large language models (LLMs).

ChatGPT, a specific implementation of AI, is a central focus in nearly every source. The table highlights its impact on various educational aspects, *including automatic text generation*, *student perceptions*, *academic integrity*, and its role in *technology-enhanced writing*. The repeated focus on *Large Language Models (LLMs)* like GPT-3 and GPT-4 shows a significant interest in understanding these models' capabilities and limitations, particularly in educational contexts.

1.3 Academic integrity.

Academic integrity is a critical concern, with multiple sources discussing its relationship with academic integrity and ChatGPT. Keywords like *plagiarism*, *ethics*, and *equity* appear frequently, indicating ongoing debates about how AI tools may challenge traditional notions of academic integrity and the measures needed to maintain integrity.

1.4 Educational technology and AI-enhanced education.

Several sources explore the broader implications of *educational technology* and *AI-enhanced education*, suggesting a future where AI tools are integrated into educational systems to support teaching and learning processes. However, there is also concern about the ethical implications and the need for thoughtful management of these technologies.

1.5 Management and policy frameworks.

Keywords like *management education*, *policy frameworks*, and *SWOT analysis* suggest a growing recognition of the need to develop strategies and policies that can effectively manage the integration of AI into educational environments.

2. Prospective implications.

2.1 Growth in AI-related educational research.

The concentration of research in 2023 and the emerging topics for 2024 suggest that AI's role in education will continue to be a hot topic. Future research will likely delve deeper into the challenges, such as maintaining academic integrity while exploring new opportunities AI offers in personalized learning and automated assessment.

2.2 Need for ethical and policy considerations.

The recurring emphasis on *ethics*, *plagiarism*, and *policy frameworks* indicates a need for developing comprehensive guidelines to address the ethical challenges posed by AI in education. These challenges will ensure that AI tools are used responsibly and equitably.

Focus on Detection and Prevention:

The 2024 focus on the *detection and prevention* of AI-generated content highlights a growing concern about the potential misuse of AI tools in academic settings. This issue could lead to the development of new technologies or methodologies to detect AI-generated content and prevent academic dishonesty.

4. Discussion

The main findings of the bibliometric analysis are as follows:

1. The study emphasizes that higher education quality, innovation, information technology, artificial AI, and ethics are central topics in research related to SDG 4;
2. AI has become a dominant area of research within education, particularly concerning its role in decision-making, learning models, natural language processing, and academic integrity;
3. The rapid adoption of AI in education has outpaced the development of institutional policies, creating conflicts between students, teachers, and university management regarding academic integrity;
4. The keyword maps for 2023 and 2024 highlight AI's dominant role in discussions about education quality and ethics, contrasting with 2022, where AI was not yet prominent;

5. By 2024, AI's relationship with academic integrity has become a central research theme, with keywords linking AI, integrity, and policy development gaining prominence;
6. Many research topics lie at the intersection of multiple disciplines, indicating that future research will require collaboration across fields such as AI, education, social sciences, and more;
7. There is an increasing focus on detecting and preventing AI-generated content to maintain academic honesty, reflecting concerns over AI's potential misuse.

One of the primary challenges in the chain "quality of education–AI–academic integrity" is the difficulty in distinguishing between original student work and AI-generated content. The rise of generative AI tools, such as ChatGPT, has made it increasingly easy for students to produce assignments that may not accurately reflect their understanding or skills. This situation complicates the assessment process and raises questions about the validity of academic credentials. Furthermore, as students increasingly rely on AI to complete their assignments, institutions must grapple with the implications for learning outcomes and the overall educational experience. The risk of students bypassing the learning process in favor of quick solutions undermines the fundamental goal of education, which is to foster critical thinking and problem-solving skills.

Additionally, the rapid evolution of AI technologies poses a challenge for educators who must adapt their teaching practices and assessment methods to maintain academic integrity. Traditional plagiarism detection tools may not be sufficient to identify AI-generated content, necessitating the development of new strategies and technologies to combat academic dishonesty. Educational institutions are tasked with creating clear guidelines for the ethical use of AI tools, ensuring students understand the boundaries of acceptable use. This task requires ongoing training for faculty and staff to stay informed about the latest developments in AI and its implications for academic integrity.

Addressing these challenges requires a collaborative effort among educators, policymakers, and technology developers. By fostering an environment that encourages the responsible use of AI while reinforcing the importance of academic integrity, educational institutions can harness the benefits of AI technologies to enhance learning outcomes. This approach aligns with the objectives of SDG 4, promoting quality education while preparing students to navigate the complexities of a technology-driven world. As AI continues to advance, educational stakeholders must engage in open discussions about the ethical implications of these tools, ensuring that the pursuit of knowledge remains grounded in integrity and authenticity.

Hypothesis 1: confirmed.

The bibliometric analysis revealed a substantial body of research demonstrating the positive impact of AI on educational outcomes. Studies have shown that AI can personalize learning experiences, improve student engagement, and provide timely feedback, leading to enhanced student achievement. Additionally, AI can help address educational inequities by providing access to high-quality education in remote areas and tailoring instruction to the needs of diverse learners.

Hypothesis 2: confirmed.

The analysis identified numerous studies highlighting the ethical concerns surrounding AI in education. Academic integrity, data privacy, algorithmic bias, and the digital divide are recurring themes in the literature. These challenges can undermine the effectiveness of AI implementation, leading to unintended negative consequences such as increased inequality and a loss of trust in technology.

Hypothesis 3: confirmed.

The analysis revealed a growing consensus among researchers that a collaborative approach is essential for the successful integration of AI into education. Studies emphasize the importance of involving educators, policymakers, and technology experts in the development and implementation of AI-powered educational tools. By working together, stakeholders can address ethical concerns, ensure equitable access, and maximize the benefits of AI for education.

5. Conclusions

The interconnection between SDG 4, which focuses on quality education, AI, and academic integrity, is increasingly significant in modern education systems. SDG 4 emphasizes the need for inclusive and equitable quality education to provide lifelong learning opportunities for all individuals, particularly those from marginalized backgrounds. Achieving this goal is critical for fostering social mobility and economic development, as education is a foundational tool for personal and societal advancement. However, integrating AI technologies into educational practices presents opportunities and challenges that must be navigated to uphold the principles of academic integrity while enhancing educational outcomes.

Based on the findings of this bibliometric analysis, the relationship between SDG 4, AI, and academic integrity is complex and multifaceted. While AI offers significant potential to enhance educational quality, accessibility, and equity, its implementation also raises ethical concerns that must be carefully addressed.

Key Findings:

- AI's potential benefits: AI can personalize learning experiences, improve resource allocation, and facilitate data-driven decision-making in education. This aligns with the goals of SDG 4 to ensure inclusive, equitable, and quality education for all;
- Ethical challenges: the implementation of AI in education raises concerns regarding data privacy, algorithmic bias, and the digital divide. These challenges can hinder the equitable and effective use of AI, potentially exacerbating existing inequalities;
- Academic integrity: AI can be used to detect and prevent academic misconduct, such as plagiarism and cheating. However, there is also a risk that AI-powered tools could be misused to facilitate cheating or undermine the principles of academic integrity.

AI has the potential to revolutionize the educational landscape by offering personalized learning experiences, automating administrative tasks, and providing real-time feedback to students. These advancements can facilitate access to high-quality educational resources, particularly in underserved regions, thereby supporting the objectives of SDG 4. For instance, AI-driven platforms can adapt to individual learning styles and paces, helping students overcome barriers to learning. However, using AI also raises concerns regarding academic integrity, as the ease of access to AI-generated content can lead to issues such as plagiarism and the misrepresentation of knowledge. Educational institutions must, therefore, strike a balance between leveraging AI's capabilities to enhance learning and ensuring that students engage in ethical academic practices.

Furthermore, the rise of AI tools in education necessitates a re-evaluation of traditional notions of academic integrity. As AI technologies become more sophisticated, they can blur the lines between original work and AI-generated content, leading to potential ethical dilemmas. Institutions are challenged to develop clear policies that address the responsible use of AI in academic settings, promoting transparency and accountability. This issue includes educating students about the ethical implications of using AI tools, fostering a culture of integrity, and implementing robust plagiarism detection systems to safeguard against academic misconduct. By addressing these challenges, educational institutions can harness the benefits of AI while reinforcing the importance of academic integrity.

The interplay between SDG 4, AI, and academic integrity presents a complex landscape that requires careful consideration and proactive measures. As the education sector continues to evolve with the integration of AI technologies, it is imperative to prioritize the principles of equity and integrity. By fostering an environment that encourages ethical use of AI while striving to achieve the goals of quality education, stakeholders can create a more inclusive and effective educational system. This approach not only aligns with the objectives of SDG 4 but also prepares students to navigate the challenges of a rapidly changing world, equipping them with the skills and values necessary for success in their future endeavors.

What about the recommendations for key stakeholders?

University managers are crucial in establishing a framework that promotes academic integrity while integrating AI technologies into educational practices. They need to develop comprehensive policies that clearly define the acceptable use of AI tools in academic settings. These policies should emphasize the importance of original work and outline the consequences of academic misconduct, including the misuse of AI-generated content. Additionally, university managers should invest in training programs for faculty and staff to ensure they are well-versed in the ethical implications of AI and can effectively communicate these principles to students. By fostering a culture of integrity and accountability, university managers can help create an environment where AI can enhance learning rather than undermine it.

Teachers are on the front lines of education and have a unique opportunity to model ethical behavior regarding the use of AI in the classroom. They should be encouraged to incorporate discussions about academic integrity into their curricula, emphasizing the value of original thought and the ethical use of AI tools. Teachers can develop clear guidelines for students on the appropriate use of AI-generated content, including proper citation practices and the importance of critical evaluation of AI outputs. Furthermore, integrating interactive activities, such as debates or Socratic dialogues, can engage students in meaningful conversations about the implications of AI on academic integrity. By actively involving students in these discussions, teachers can help them internalize the importance of ethical standards and responsible AI use.

Scientists and researchers must navigate AI's challenges while maintaining high academic integrity standards in their work. Institutions should establish clear guidelines addressing the ethical use of AI in research, including transparency about using AI tools in data analysis, writing, and publishing. Researchers should be encouraged to disclose their use of AI technologies in their methodologies to ensure accountability and reproducibility. Additionally, fostering collaboration between researchers and ethicists can help develop best practices for the responsible use of AI in scientific inquiry. By prioritizing ethical considerations and transparency, researchers can uphold the integrity of their work and contribute to a culture of trust within the academic community.

Students are key stakeholders in the conversation about academic integrity and the use of AI in education. Institutions should provide resources and workshops that educate students on the ethical implications of AI and the importance of maintaining academic integrity. Clear expectations regarding the use of AI tools should be communicated, along with examples of acceptable and unacceptable practices. Encouraging students to view AI as a collaborative tool rather than a shortcut can foster a more responsible approach to its use in their studies. Additionally, institutions should create platforms for students to voice their concerns and experiences related to AI and academic integrity, promoting an open dialogue that can inform policy adjustments and enhance the educational experience. By empowering students with knowledge and resources, institutions can cultivate a generation of ethically-minded individuals who understand the significance of integrity in their academic pursuits.

The intersection of SDG 4, which emphasizes quality education, AI, and academic integrity, presents a rich landscape for future research. One promising direction is exploring how AI technologies can be effectively integrated into educational practices while promoting academic integrity. Researchers should investigate the development of AI-driven educational tools that enhance personalized learning experiences and incorporate mechanisms to uphold ethical standards. This action includes examining how AI can assist in detecting academic misconduct, such as plagiarism and cheating while fostering a culture of integrity among students. By focusing on the dual role of AI as both a facilitator of learning and a guardian of academic standards, future studies can provide valuable insights into best practices for integrating technology in educational settings.

Another critical area for future research is the evaluation of the ethical implications of AI in education. As AI tools become increasingly sophisticated, understanding their impact on academic integrity is essential. Researchers should conduct studies that assess the

perceptions of students and educators regarding the use of AI in academic work, including its potential to encourage or discourage dishonest behaviors. This research could involve qualitative methods, such as interviews and focus groups, to gather in-depth insights into the attitudes and experiences of various stakeholders. Additionally, comparative studies across different educational contexts and cultures could illuminate how varying approaches to AI integration affect academic integrity, providing a more comprehensive understanding of the global landscape.

Furthermore, there is a need for research focused on redesigning assessment methods in light of AI advancements. Traditional assessment strategies may be inadequate in a landscape where AI can easily generate text and solve problems. Future studies should explore innovative assessment techniques that challenge students' critical thinking and creativity and minimize opportunities for AI-assisted plagiarism. This fact could involve the development of project-based assessments, oral presentations, and collaborative work that require more profound engagement with the material. By investigating how to adapt assessments to the realities of AI, researchers can contribute to the ongoing dialogue about maintaining academic integrity while leveraging technological advancements in education.

Finally, the role of institutional policies in shaping the relationship between AI, academic integrity, and quality education warrants further exploration. Research should focus on how universities can create comprehensive policies that guide the ethical use of AI tools, ensuring that these technologies enhance rather than undermine educational outcomes. This includes examining honor codes' effectiveness, faculty and students' training programs, and integrating AI literacy into curricula. By evaluating the impact of these policies on student behavior and academic performance, future research can provide actionable recommendations for educational institutions seeking to navigate the complexities of AI in the context of SDG 4 and academic integrity.

Comprehensive analysis of the relationship: the bibliometric analysis provides a comprehensive analysis of the complex relationship between AI technologies and academic integrity. It explores both the potential benefits of AI in enhancing educational practices and the risks it poses to academic integrity.

So, after all, we summarize the contribution of this article to the problem of studying the "relationship" between AI and academic honesty in the context of improving the quality of education:

1. Identification of key ethical concerns: the bibliometric analysis identifies and discusses key ethical concerns associated with AI in education. These concerns are critical to address to ensure the responsible and equitable use of AI in educational settings.
2. Recommendations for ethical AI implementation: based on the findings, the bibliometric analysis provides recommendations for the ethical and responsible implementation of AI in education. These recommendations may include guidelines for data privacy, measures to address algorithmic bias, and strategies for ensuring equitable access to AI-powered educational resources.
3. Contribution to the broader literature: The review adds to the growing body of research on AI in education and academic integrity, providing valuable insights and evidence for policymakers, educators, and researchers.

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References

1. Okulich-Kazarin, V.; Artyukhov, A.; Skowron, Ł.; Artyukhova, N.; Dluhopolskyi, O.; Cwynar, W. Sustainability of Higher Education: Study of Student Opinions about the Possibility of Replacing Teachers with AI Technologies. *Sustainability* **2024**, *16*, 55. [CrossRef]
2. Boeren, E. Understanding Sustainable Development Goal (SDG) 4 on "quality education" from micro, meso and macro perspectives. *Int. Rev. Educ.* **2019**, *65*, 277–294. [CrossRef]
3. Saini, M.; Sengupta, E.; Singh, M.; Singh, H.; Singh, J. Sustainable Development Goal for Quality Education (SDG 4): A study on SDG 4 to extract the pattern of association among the indicators of SDG 4 employing a genetic algorithm. *Educ. Inf. Technol.* **2022**, *28*, 2031–2069. [CrossRef]
4. UNESCO. *Global Education Monitoring Report 2019: Migration, Displacement and Education—Building Bridges, Not Walls*; UNESCO: Paris, France, 2019; 362p. Available online: https://www.unesco.org/gem-report/en/migration (accessed on 1 September 2024).
5. Topcu, E. Education and Economic Growth: Evidence from the EUROMED Countries. *Eur. Rev.* **2023**, *31*, 632–646. [CrossRef]
6. UNESCO. *Education in a Post-COVID World: Nine Ideas for Public Action*; UNESCO: Paris, France, 2021. Available online: https://www.unesco.org/en/articles/education-post-covid-world-nine-ideas-public-action (accessed on 1 September 2024).
7. Balta, N. Ethical Considerations in Using AI in Educational Research. *J. Res. Didact. Sci.* **2023**, *2*, 14205. [CrossRef]
8. Almasri, F. Exploring the Impact of Artificial Intelligence in Teaching and Learning of Science: A Systematic Review of Empirical Research. *Res. Sci. Educ.* **2024**, *54*, 977–997. [CrossRef]
9. Vinuesa, R.; Azizpour, H.; Leite, I.; Balaam, M.; Dignum, V.; Domisch, S.; Felländer, A.; Langhans, S.D.; Tegmark, M.; Nerini, F.F. The role of artificial intelligence in achieving the Sustainable Development Goals. *Nat. Commun.* **2020**, *11*, 233. [CrossRef]
10. Ogunleye, J.K.; Afolabi, C.S.; Ajayi, S.O.; Omotayo, V.A. Virtual Learning as an Impetus for Business Education Programme in the Midst of COVID-19 in Nigeria. *Health Econ. Manag. Rev.* **2023**, *4*, 83–89. [CrossRef]
11. Oe, H.; Zhu, X.; Weeks, K. Exploring Leadership and Other Influential Dimensions When Assessing Online Learning Modules within Higher Education Institutions: Insights from Flow Theory and Two-Factor Principles. *Bus. Ethics Leadersh.* **2024**, *8*, 20–34. [CrossRef]
12. Kaouache, D.E.; Amara, C.; Chatter, C.; Kaouache, A. The Effect of Individual Entrepreneurial Orientation on Entrepreneurial Intention Among University Students. *Bus. Ethics Leadersh.* **2024**, *8*, 63–75. [CrossRef]
13. Yang, Y.; Yin, T.; Li, R.; Wang, X. Effectiveness of Higher Education Financing: DEA and SFA Modelling. *Bus. Ethics Leadersh.* **2024**, *8*, 172–189. [CrossRef]
14. Roba, M.; Moulay, O.K. Risk Management in Using Artificial Neural Networks. *SocioEcon. Chall.* **2024**, *8*, 302–313. [CrossRef]
15. Tchoketch-Kebir, H.; Madouri, A. Research Leadership and High Standards in Economic Forecasting: Neural Network Models Compared with Etalon ARIMA Models. *Bus. Ethics Leadersh.* **2024**, *8*, 220–233. [CrossRef]
16. Mujtaba, B. Clarifying Ethical Dilemmas in Sharpening Students' Artificial Intelligence Proficiency: Dispelling Myths About Using AI Tools in Higher Education. *Bus. Ethics Leadersh.* **2024**, *8*, 107–127. [CrossRef]
17. Nuñez, J.G.; Bolognesi, M. Exploring Team Collaboration in the New Metaverse (The 3D-AI Internet). *SocioEcon. Chall.* **2024**, *8*, 314–341. [CrossRef]
18. Hrytsenko, L.; Pakhnenko, O.; Kuzior, A.; Kozhushko, I. Smart technologies in banking. *Financ. Mark. Inst. Risks* **2024**, *8*, 81–93. [CrossRef]
19. Priyadarshi, A.; Singh, P. Role of FinTech Apps in Increasing Investment Decisions: A Study on the Capital Market. *Financ. Mark. Inst. Risks* **2024**, *8*, 186–197. [CrossRef]
20. Leonov, S.; Yarovenko, H.; Boiko, A.; Dotsenko, T. Information system for monitoring banking transactions related to money laundering. *CEUR Workshop Proc.* **2019**, *2422*, 297–307. Available online: https://ceurspt.wikidata.dbis.rwth-aachen.de/Vol-2422/paper24.pdf (accessed on 1 September 2024). [CrossRef]
21. Lyeonov, S.; Żurakowska-Sawa, J.; Kuzmenko, O.; Koibichuk, V. Gravitational and intellectual data analysis to assess the money laundering risk of financial institutions. *J. Int. Stud.* **2020**, *13*, 259–272. [CrossRef]
22. Sheliemina, N. The Use of Artificial Intelligence in Medical Diagnostics: Opportunities, Prospects and Risks. *Health Econ. Manag. Rev.* **2024**, *5*, 104–124. [CrossRef]
23. Pakhnenko, O.; Pudło, T. HealthTech in ensuring the resilience of communities in the post-pandemic period. *Health Econ. Manag. Rev.* **2023**, *4*, 31–39. [CrossRef]

24. Wright, J. Healthcare cybersecurity and cybercrime supply chain risk management. *Health Econ. Manag. Rev.* **2023**, *4*, 17–27. [CrossRef]
25. Strielkowski, W.; Samoilikova, A.; Smutka, L.; Civín, L.; Lieonov, S. Dominant trends in intersectoral research on funding innovation in business companies: A bibliometric analysis approach. *J. Innov. Knowl.* **2022**, *7*, 100271. [CrossRef]
26. Bilan, S.; Šuleř, P.; Skrynnyk, O.; Krajňáková, E.; Vasilyeva, T. Systematic bibliometric review of artificial intelligence technology in organizational management, development, change and culture. *Bus. Theory Pract.* **2022**, *23*, 1–13. [CrossRef]
27. Niftiyev, I.; Kheyirkhabarli, M. The Impact of COVID-19 Pandemic on Cryptocurrency Adoption in Investments: A Bibliometric Study. *SocioEcon. Chall.* **2024**, *8*, 154–169. [CrossRef]
28. Borissov, D. Agile Methods in the Social Work: Research Landscape Analysis. *SocioEcon. Chall.* **2024**, *8*, 64–87. [CrossRef]
29. Zámek, D.; Zakharkina, Z. Research Trends in the Impact of Digitization and Transparency on National Security: Bibliometric Analysis. *Financ. Mark. Inst. Risks* **2024**, *8*, 173–188. [CrossRef]
30. Kozhushko, I. Transformation of Financial Services Industry in Conditions of Digitalization of Economy. *Financ. Mark. Inst. Risks* **2023**, *7*, 189–200. [CrossRef]
31. Dobrovolska, O.; Ortmanns, W.; Podosynnikov, S.; Halynskyi, D.; Miniailo, A. Start-Ups and Entrepreneurship in Renewable Energy: Investments and Risks. *Financ. Mark. Inst. Risks* **2024**, *8*, 213–240. [CrossRef]
32. Huzenko, M.; Kononenko, S. Sustainable Agriculture: Impact on Public Health and Sustainable Development. *Health Econ. Manag. Rev.* **2024**, *5*, 125–150. [CrossRef]
33. Artyukhov, A.; Volk, I.; Surowiec, A.; Skrzypek-Ahmed, S.; Bliumska-Danko, K.; Dluhopolskyi, O.; Shablystyi, V. Quality of Education and Science in the Context of Sustainable Development Goals—From Millennium Goals to Agenda 2030: Factors of Innovation Activity and Socioeconomic Impact. *Sustainability* **2022**, *14*, 11468. [CrossRef]
34. Artyukhov, A.; Volk, I.; Vasylieva, T.; Lyeonov, S. The role of the university in achieving SDGs 4 and 7: A Ukrainian case. *E3S Web Conf.* **2021**, *250*, 04006. [CrossRef]
35. Volk, I.; Artyukhov, A.; Lyeonov, S. Modeling of information system for blended education quality assurance and socioeconomic impact. In Proceedings of the 2022 IEEE 16th International Conference on Advanced Trends in Radioelectronics, Telecommunications and Computer Engineering (TCSET), Lviv-Slavske, Ukraine, 22–26 February 2022; pp. 590–593. [CrossRef]
36. Okulich-Kazarin, V.; Artyukhov, A.; Skowron, Ł.; Artyukhova, N.; Wołowiec, T. Will AI Become a Threat to Higher Education Sustainability? A Study of Students' Views. *Sustainability* **2024**, *16*, 4596. [CrossRef]
37. Rudolph, J.; Tan, S.; Tan, S. ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *J. Appl. Learn. Teach.* **2023**, *6*, 342–363. [CrossRef]
38. Cotton, D.R.E.; Cotton, P.A.; Shipway, J.R. Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innov. Educ. Teach. Int.* **2024**, *61*, 228–239. [CrossRef]
39. Lim, W.M.; Gunasekara, A.; Pallant, J.L.; Pallant, J.I.; Pechenkina, E. Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators. *Int. J. Manag. Educ.* **2023**, *21*, 100790. [CrossRef]
40. Farrokhnia, M.; Banihashem, S.K.; Noroozi, O.; Wals, A. A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innov. Educ. Teach. Int.* **2024**, *61*, 460–474. [CrossRef]
41. Rudolph, J.; Tan, S.; Tan, S. War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *J. Appl. Learn. Teach.* **2023**, *6*, 364–389. [CrossRef]
42. Wu, T.; He, S.; Liu, J.; Sun, S.; Liu, K.; Han, Q.-L.; Tang, Y. A Brief Overview of ChatGPT: The History, Status Quo and Potential Future Development. *IEEE/CAA J. Autom. Sin.* **2023**, *10*, 1122–1136. [CrossRef]
43. Rahman, M.M.; Watanobe, Y. ChatGPT for Education and Research: Opportunities, Threats, and Strategies. *Appl. Sci.* **2023**, *13*, 5783. [CrossRef]
44. Perkins, M. Academic Integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond. *J. Univ. Teach. Learn. Pract.* **2023**, *20*, 7. [CrossRef]
45. Crawford, J.; Cowling, M.; Allen, K.-A. Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI). *J. Univ. Teach. Learn. Pract.* **2023**, *20*, 02. [CrossRef]
46. Sullivan, M.; Kelly, A.; McLaughlan, P. ChatGPT in higher education: Considerations for academic integrity and student learning. *J. Appl. Learn. Teach.* **2023**, *6*, 31–40. [CrossRef]
47. Chan, C.K.Y. A comprehensive AI policy education framework for university teaching and learning. *Int. J. Educ. Technol. High. Educ.* **2023**, *20*, 38. [CrossRef]
48. Strzelecki, A. To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology. *Interact. Learn. Environ.* **2023**, 1–14. [CrossRef]
49. Yan, D. Impact of ChatGPT on learners in a L2 writing practicum: An exploratory investigation. *Educ. Inf. Technol.* **2023**, *28*, 13943–13967. [CrossRef]
50. Eke, D.O. ChatGPT and the rise of generative AI: Threat to academic integrity? *J. Responsible Technol.* **2023**, *13*, 100060. [CrossRef]
51. Shoufan, A. Exploring Students' Perceptions of ChatGPT: Thematic Analysis and Follow-Up Survey. *IEEE Access* **2023**, *11*, 38805–38818. [CrossRef]

52. Javaid, M.; Haleem, A.; Singh, R.P.; Khan, S.; Khan, I.H. Unlocking the opportunities through ChatGPT Tool towards ameliorating the education system. *BenchCouncil Trans. Benchmarks Stand. Eval.* **2023**, *3*, 100115. [CrossRef]
53. Holmes, W.; Tuomi, I. State of the art and practice in AI in education. *Eur. J. Educ.* **2022**, *57*, 542–570. [CrossRef]