

*Artificial Intelligence in Art and Design Education:  
A Bibliometric Study of Emerging Trends*

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**Abstract**

The integration of artificial intelligence (AI) has revolutionized education, but its impact on art and design remains relatively unexplored. This study aims to comprehensively evaluate the research status and development trend in this field. Using bibliometrics and VOSviewer, the relevant literature on artificial intelligence in art design education in Scopus database is deeply analyzed. Artificial Intelligence in Education (AIEd) framework, a framework regarding the use of AI in education, is also used to evaluate results of bibliometrics analysis. Research in this field began in 2020, but the number of relevant papers is limited, only 164, with major contributions from China, the United States and Australia, and the literature retrieved is mainly in English. The gap between its maturity and potential benefits to education and its application in education is reviewed. This study highlights the key considerations for the effective AI integration into art and design education. However, based on AIEd Technologies framework, the research results show that there is still a lack of in-depth research on the application of Gen-AI technology, especially on expert systems, personalized learning system, and visualizations and virtual learning environments, in art design education in the existing literature. This study provides valuable references for art and design educators who are leading innovation in AI education and suggests further exploration of the educational potential of Gen-AI technology.

Keywords: Artificial Intelligence, Art and Design, Bibliometrics, Scopus, VOSviewer

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## **1. Introduction**

The integration of education with technology has marked the dawn of a novel epoch in the realm of learning (Ayanwale et al., 2024). Since the 1970s, the field of Artificial Intelligence in Education (AIED) has significantly influenced the application of technology to instruction and learning, aiming to improve the learning process and promote student achievements (Southgate et al., 2019). The recent advancements in big data analytics, machine learning algorithms, and natural language processing have catapulted AI's educational applications into a new phase of explosive growth, reshaping traditional paradigms of teaching, learning, and administrative processes (Singh, 2023).

In the realm of art and design education, fostering innovation and creative thinking remains a central pedagogical objective (Samaniego et al., 2024). The potential of AI in this context is particularly promising, as it aids students in creative design and artistic endeavors (Hutson, 2024), while equipping educators with data-driven insights into student learning behaviors, thereby facilitating personalized teaching content and methods (Yu et al., 2020). Despite the significant potential of AI in educational contexts, its specific applications and benefits within art and design education have not been exhaustively investigated, presenting a notable gap in the literature.

This study aims to address this gap by conducting a comprehensive bibliometric analysis and visualization of the literature on AI in art and design education within the Scopus database, utilizing tools such as VOSviewer. The research endeavors to elucidate the current state and trajectory of research in this domain, providing a deeper understanding of AI's role in art and design education. Furthermore, it offers guidance and inspiration for future educational practices and scholarly pursuits, ultimately promoting the field's innovative growth.

The AIED framework serves as a theoretical model for assessing the impact of AI in educational contexts (Xu & Ouyang, 2022), providing a structured lens through which to evaluate its application in art and design education. This framework dissects AI's educational application across various dimensions, including social networking sites and chatbots, educational expert systems, intelligent tutors and agents, machine learning, personalized education systems, and virtual educational environments (Tapalova & Zhiyenbayeva, 2022). It enables researchers to pinpoint AI's educational applications, gauge its impact on learning outcomes, and explore optimization strategies to better serve educational goals (Bittencourt et al., 2023).

By conducting this study, we aim to contribute to the body of knowledge by highlighting the key considerations for the effective integration of AI into art and design education. Our findings will provide valuable references for art and design educators leading innovation in AI education and suggest further exploration of the educational potential of AI technology, thereby bridging the gap between AI's maturity and its application in art and design education.

## **2. Methods**

This is about artificial intelligence in art design education research with bibliometric analysis.

## **2.1 Bibliometric Analysis Approach**

Given the purpose of the research, This study carries out bibliometrics analysis, which includes a descriptive review of publications over a specific period and the creation of bibliometrics maps based on accepted guidelines in the scientific field, and follow the accepted guidelines for this type of research in the scientific field (Dávila Rodríguez et al., 2009).

## **2.2 Data Collection Strategy**

To ensure a thorough and systematic search strategy, we utilized the Scopus database, which is renowned for its extensive coverage of peer-reviewed literature across various scientific fields (Baas et al., 2020). The query was conducted on August 26, 2024, at 15:50, considering titles, common keywords, and abstracts, as search criteria, all with the aim of obtaining a clear perspective on the direction of studies related to artificial intelligence in the field of art and design education (Baas et al., 2020).

The formula and search filters employed in Scopus included the following parameters: TITLE-ABS-KEY (“artificial intelligence” OR “AI” AND “design education” OR “art and design education” OR “Art Design Studies”). To ensure the relevance of the retrieved documents, we limited our search to articles published in English and filtered the results to include only scholarly articles and conference proceedings.

## **2.3 Data Visualization and Analysis Tools**

The VOSviewer 1.6.20 software (VOSviewer - Visualizing Scientific Landscapes, n.d.) was instrumental in visualizing the bibliometric data, allowing us to map (Khodabandelou et al., 2022), and analyze the co-occurrence of keywords and the collaborative relationships among authors and institutions (Mishra et al., 2022). This software facilitated the creation of a comprehensive bibliometric map, which revealed the key themes and trends within the field. By examining the co-occurrence network of keywords, we were able to identify the central concepts and the interconnectivity between various research areas. The analysis of author collaboration maps provided insights into the research community’s structure and the extent of international cooperation in this domain.

We use VOSviewer to check author-collaboration mapping and keyword co-occurrence. Author collaboration refers to the contact between authors, participation in the contribution of the country or affiliated institution to the development of the discipline or field. For author collaboration analysis, we use all the data and set the minimum threshold to 1 time. On the other hand, keyword co-occurrence analysis is a semantic network that describes the relationships between keywords. In keyword co-occurrence mapping, we use full counting, with all keywords as the unit of analysis. In addition, the study placed limits on the analysis, for example, limiting the minimum number of keyword occurrences to five. Therefore, out of 1,210 keywords in 164 articles, only 43 keywords met this threshold. The VOSviewer mapped data is then verified against the data retrieved from the Scopus log file for calculation and tabulation to obtain a more complete understanding.

## 2.4 Application of the AIEd Framework

To further enhance the analysis, we applied the AIEd framework to evaluate the retrieved articles, which allowed us to assess the alignment of AI applications in art and design education with educational objectives, pedagogical strategies, and technological advancements. This framework-based evaluation enabled us to discern the transformative potential of AI technologies in enhancing educational practices and student outcomes.

## 2.5 Data Extraction and Preliminary Analysis

The data extracted from the Scopus database included bibliographic elements such as article titles, authors, publication dates, keywords, abstracts, and citation counts. A total of 164 articles were found, this information was exported in CSV and RIS formats for further analysis using VOSviewer. The meticulous organization and analysis of this data allowed us to present a detailed account of the research landscape in AI and art and design education.

## 3. Results and Discussion

### 3.1 Research Impacts

Figure 1 presents a visual representation of the growth in published literature on AI in art and design education, spanning from 1984 to 2024. There are 30 publications from 1984 to 2012, 34 from 2017 to 2021 and 102 published papers from 2022 to 2024. It was found that the number of publications in the latter one periods was nearly twice that of the first two period. This finding could be related to the strong rise of artificial intelligence technology in the past 3 years, particularly since November 2022, the date on which OpenAI began to release its generative artificial intelligence product, ChatGPT. This subsequently gave way to the emergence of similar technologies, such as Kimi, and Bard, among others.

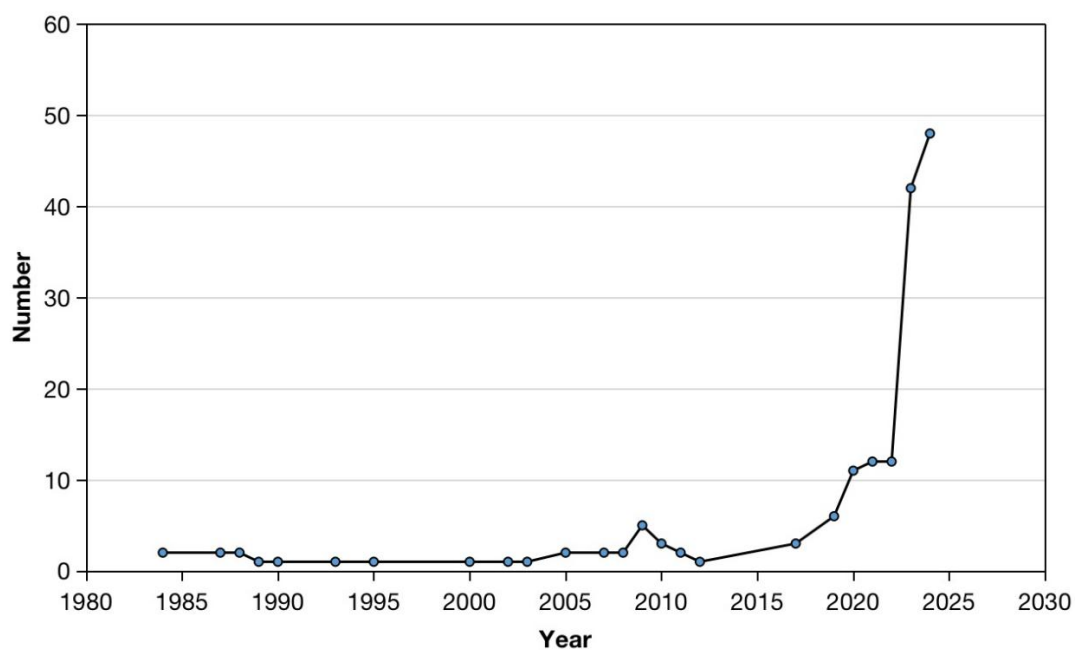


Figure 1: Published Literature on AI in Art and Design Education From 1984 to 2024

The significant rise in publications from 2022 to 2024 highlights the growing interest in AI's application in art and design education, mirroring AI's expanding influence across disciplines. This trend is set to continue, with research in AI and education expected to grow from 2025 to 2035, driven by ongoing AI advancements and educational tool integration. Initially discussed in 1984, AI's role in design education has evolved from theory to practical use in CAD (Radcliffe & Holt, 1984) and other areas. The field's development shows AI moving from a conceptual stage to an essential part of current educational and design practices.

Table 1 highlights the top 5 journals with the highest number of publications on artificial intelligence in art and design education, showcasing their academic rankings and influence within the field. IEEE Access leads the list, demonstrating exceptional prominence with the highest SJR value and H-index, indicative of its significant impact and scholarly recognition in the domain of artificial intelligence in art and design education. The remaining journals, including the ACM International Conference Proceeding Series, Applied Sciences (Switzerland), Lecture Notes in Networks and Systems, and E3S Web of Conferences, each with their respective SJR and H-index scores that mirror their standing and influence in the academic community. The quartile rankings (Q1 to Q4) offer a comparative measure of each journal's performance, with Q1 indicating the top 25% of publications, Q2 the top 50%, and Q4 representing the lower 25%. These rankings provide insight into the journals' academic reach and their contributions to advancing knowledge in AI applications for art and design education.

IEEE Access's leading position in the ranking highlights its significance as a top journal for AI research in art and design education. Other noted journals contribute to the field's discourse, with their rankings reflecting their academic impact and audience reach, from Q1 to Q4. These rankings are valuable for researchers considering where to publish and for identifying research opportunities.

Table 1: Top 5 Journals With the Highest Number of Publications on Artificial Intelligence in Art and Design Education

Ranking	Journal	Articles	SJR	Quartile	H-index
1	IEEE Access	40,115	0.96	Q1	242
2	ACM International Conference Proceeding Series	35,675	0.253	Q3	151
3	Applied Sciences (Switzerland)	34,291	0.508	Q2	130
4	Lecture Notes in Networks and Systems	24,954	0.171	Q4	36
5	E3S Web of Conferences	23,855	0.182	Q2	39

In total, there were 711 citations distributed across 80 documents, with the remaining 84 documents receiving none. The majority of the top ten cited articles were published after 2010, with only three exceptions from the years 2002, 2003, and 2009. On average, each of these cited articles garnered 8.8875 citations annually. Table 2 presents the 5 articles with the highest number of citations that address the field of artificial intelligence in art and design education. It was noteworthy that these ten articles alone had accumulated 414 citations. The article (Dove et al., 2017), with 280 citations, explores how ML in AI can be a part of UX design education through a survey of UX designers, discussing how new research and new curricula may help us unlock the power of design thinking to reimagine ML to enhance the teaching and learning process for the benefit of students.

Table 2: Most-Cited Articles

Rank	Title	Journal/Conference Name	Authors, Year	Total of Citations
1	UX design innovation: Challenges for working with machine learning as a design material	Conference on Human Factors in Computing Systems - Proceedings	Dove G.; Halskov K.; Forlizzi J.; Zimmerman J., 2017	280
2	The effectiveness of social media and multimedia-based pedagogy in enhancing creativity among art, design, and digital media students	International Journal of Emerging Technologies in Learning	Al Hashimi S.; Al Muwali A.; Zaki Y.; Mahdi N., 2019	45
3	Interactive storytelling for children	Proceedings of IDC2010: The 9th International Conference on Interaction Design and Children	Garzotto F.; Paolini P.; Sabiescu A., 2010	41
4	ChatGPT for design, manufacturing, and education	Procedia CIRP	Wang X.; Anwer N.; Dai Y.; Liu A., 2023	32
5	The challenge of integrating AI & smart technology in design education	International Journal of Technology and Design Education	McCardle J.R., 2002	16

The citation distribution underscores a trend of increasing scholarly attention to AI's role in art and design education, particularly in the last decade. The prominence of articles published after 2010 among the top-cited indicates a surge in impactful research that aligns with the broader technological advancements in AI. The significant number of citations for the Dove et al. study reflects its influential perspective on integrating AI into educational practices, highlighting the value of design thinking in shaping AI applications in education.

Among the 164 documents analyzed, a total of 377 distinct authors were identified. Notably, four authors Ali H., Kumar T. (VOSviewer - Visualizing Scientific Landscapes, n.d.), Sha Z., and Zhang X. each contributed a maximum of three documents, while the majority, 349 authors, were associated with a single document. This distribution results in an average of approximately 0.44 documents per author, pointing to a predominantly individual rather than collaborative authorship pattern.

In a corpus of 164 scholarly works, authorship was ambiguous in 18 cases, while 146 studies had clearly identified authors. Among these, 115 studies involved two or more authors, constituting approximately 78.76% of the total, suggesting that most of the research in this

domain is collaborative in nature, as solo-authored works represent a mere 21.23%. However, this collaborative effort seems confined to small, insular groups, with the most extensive collaboration observed across no more than two documents. This pattern implies a relatively limited scope of scientific networking and collaborative engagement among authors focused on this subject matter, with a notable absence of interconnectivity among these author collectives.

There are 160 affiliates out of 164 identified documents. Most institutions only produce one document. Only 33 institutions produce more than one. The University of İstanbul Teknik Üniversitesi was the institution that produced the most documents, numbering five. Arizona State University Polytechnic Campus, Indian Institute of Science, Georgia Institute of Technology, PES University and Ira A. Fulton Schools of Engineering produced three documents. Twenty-seven institutions, including Arizona State university and the Univerza v Mariboru case, each produced two documents.

Of the 164 articles examined, 35 countries were identified as participating in international scientific publications in the field of study. Of this group of countries, 5 reached the minimum standard of having at least 10 articles and 15 citations. Table 3 shows the ranking of the 5 leading countries based on the number of publications and citations obtained. In terms of citations, it is worth noting Denmark, despite not featuring in the top article publications, stands out with the second-highest number of citations, 280, indicating potentially high-impact research. This table underscores the global distribution of scholarly efforts and influence in the intersection of AI and art and design education, with a notable emphasis on the leading roles of China and the United States in both publication output and research impact.

Table 3: Publications by Country and Citations by Country

<b>Ranking</b>	<b>Country</b>	<b>Articles</b>	<b>Ranking</b>	<b>Country</b>	<b>Citations</b>
1	China	39	1	United States	356
2	United States	33	2	Denmark	280
3	Australia	10	3	China	68
4	China-Taiwan	10	4	Australia	47
5	United Kingdom	10	5	Bahrain	45

Through a bibliometric map based on published articles, Figure 2 shows the cooperation between the countries participating in this analysis.

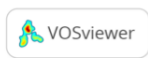


Figure 2: Global Collaboration Through Documents Published by Country, Based on Data Obtained From Scopus

Of the 164 documents, only 5 are in a non-English language, namely, Japanese, Korean and Slovenian respectively.

### 3.2 Research Clusters

A total of 43 keywords are included in the 164 Artificial Intelligence in Art and Design Education articles. Figure 3 shows the cluster analysis results generated by VOSviewer, including the dynamic change and network map. The most frequently used keywords are “artificial intelligence”, “design education”, “students”, “curricula” and “engineer education”. This research focuses on AI and its applications in the arts and education. However, this figure is far less than the 35,066 documents obtained using the keywords “artificial intelligence” and “education.” This wide disparity in search results indicates that the topic has not been widely studied.



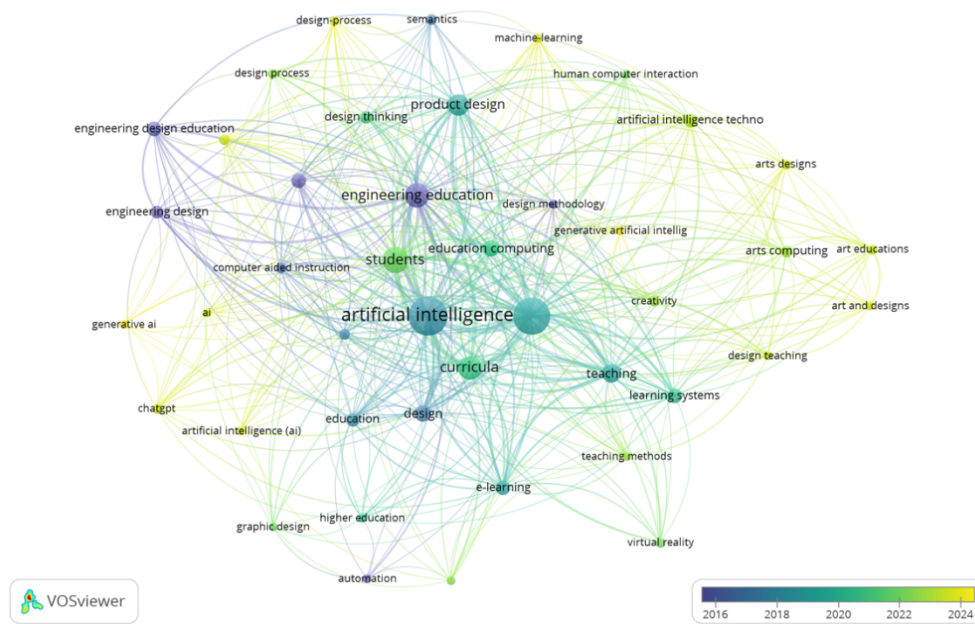


Figure 3: Analysis of Keyword Co-occurrence Between 1984 and 2024  
 (3.1) The distribution of the Art and Design Education research using the keyword by years.

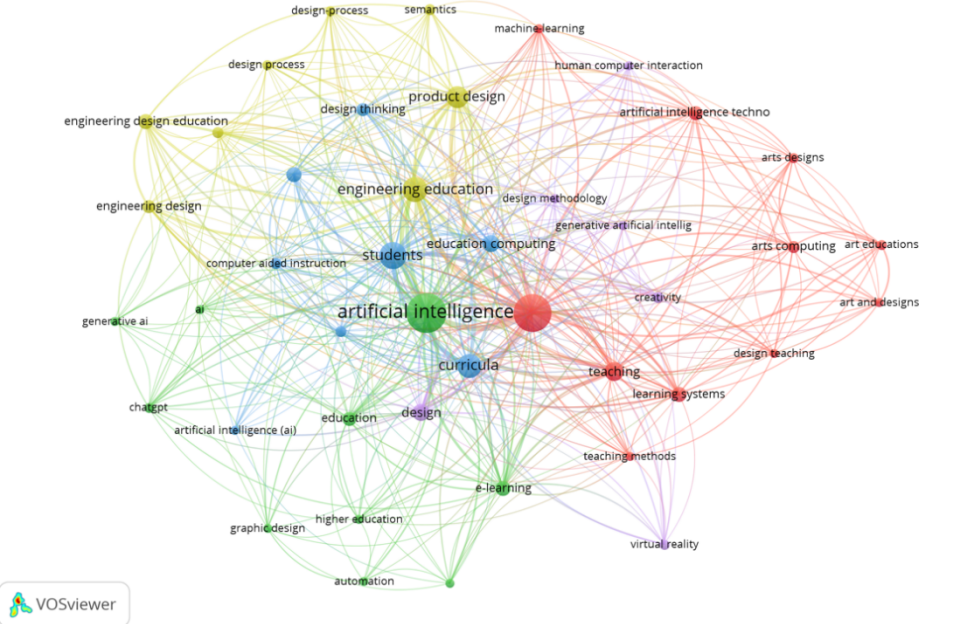


Figure 3: Analysis of Keyword Co-occurrence Between 1984 and 2024  
 (3.2) The most used keyword in the Art and Design Education research.

In addition to Art and Design Education, Figure 3.1 shows that the popular author keywords in recent studies are generative ai, ChatGPT, AI tools, art designs, design process and so on. This implies that the field of artificial intelligence, particularly generative AI, is experiencing a surge in interest and application across various domains such as art, design, and academic research. It suggests a significant shift towards integrating AI technologies into creative and intellectual pursuits, the integration of AI in art and design is leading to innovative approaches in design processes, enabling designers to explore new artistic expressions and

enhance their creative workflows. AI tools are being utilized to generate ideas, optimize designs, and even create unique art pieces that blend human creativity with AI-generated content.

Figure 3.2 shows 5 main clusters of Art and Design Education research, that is, “art and design learning”, “ai and education”, “AI-assisted and design Thinking”, “design process” and “design education”, as displayed in red, green, blue, yellow and purple.

The studies in Cluster 1(Art and Design Learning) focus on various aspects of art and design education and how artificial intelligence and machine learning techniques can be used to improve the quality and effectiveness of education.

Cluster 2 (AI and Education) focuses on the application of AI technologies in the field of education, specifically how to improve the quality of education and learning experience through technologies such as automation, generative AI, e-learning platforms, and visual communication.

Cluster 3 (AI-Assisted and Design Thinking) focuses on computer-aided design and teaching and cultivates students’ design thinking using artificial intelligence in curriculum design.

Cluster 4 (Design Process) focuses on engineering design and education, with a particular emphasis on how AI tools and techniques can be used to improve the design process.

Cluster 5 (Design education) focuses on design innovation, design methodology, and how to use artificial intelligence, human-computer interaction, virtual reality and other technologies to improve the design education.

### **3.3 Implications of Limited Research and Potential Benefits**

While the current body of research on AI in art and design education is not extensive, it does indicate that AI has the capacity to enhance teaching methods (Omran Zailuddin et al., 2024) in areas such as product (Huang et al., 2024) and visual design (Li et al., 2024). It can be incorporated into collaborative teaching strategies, which may lead to more personalized (Tapalova & Zhiyenbayeva, 2022), efficient, and sustainable educational approaches. This integration could stimulate creativity (Almaz et al., 2024) across various design fields, including architecture (Almaz et al., 2024), graphic design (Fleischmann, 2024), industrial design (Chung et al., 2024), and user experience design (Zhang et al., 2024), and it may also encourage the development of critical thinking skills (Jung & Suh, 2024). Moreover, AI-driven design tools have the potential to assist students in discovering innovative (Barak et al., 2020) avenues for creative self-expression (Omran Zailuddin et al., 2024).

Although the analysis combined with AIED technology framework reveals that the exploration of the application of Gen-AI technology in the field of art and design education is still in the early stage, there is a significant lack of in-depth research in these fields. While Gen-AI technologies offer great application potential for art and design education, further research is needed to explore how these technologies can be effectively integrated into curricula and to assess their specific impact on student learning processes and teaching practices.

#### 4. Conclusions

The study utilizes bibliometric analysis to offer a comprehensive overview of the research topic “Artificial Intelligence in Art and Design Education,” as indexed in the Scopus database. With the assistance of VOSviewer, the study reveals a significant increase in the number of publications, from 10 in 1984 to 40 in 2024, with substantial growth projections for the future. This trend clearly demonstrates the academic community’s growing interest in the intersection of AI with art and design, underscoring the acceleration of research in this field due to recent advancements in AI technology.

Although we retrieved and evaluated 164 relevant documents through the AIED framework, the findings indicate that there is a paucity of in-depth research on the application of Gen-AI technology in art and design education, particularly in areas such as expert systems, personalized learning systems, and visualization and virtual learning environments. This suggests that the integration of AI in art and design education remains in its nascent stages.

China, the United States, and Australia are prominent in terms of both the number of articles and citations, attesting to their significant influence in this field. However, while the UK and Taiwan (China) rank in the top five for the number of articles, they are surpassed by Denmark and Bahrain in terms of citations. This indicates that although Denmark and Bahrain produce fewer publications, their research exerts a broader impact.

In terms of research keywords, “artificial intelligence” and “art and design education” predictably dominate the list. It is intriguing to note the presence of terms such as “ChatGPT/Tools,” reflecting the impact of user-oriented technical software, and “design process,” indicating studies on the interplay within the design process. Terms like “pedagogy,” “machine learning,” and “learning systems” highlight the AI techniques and tools that have been extensively explored in the context of art and design education. These key terms reflect a diverse spectrum of perspectives on universal themes and areas of interest concerning the relationship between AI and art and design education.”

The limitations of this study include a “single keyword array”, “reliance on a single database (Scopus), and a focus on “only quantitative literature analysis.” For future research, it is recommended to expand the array of search keywords, such as incorporating “machine learning” and “product design.” Additionally, incorporating other databases like Web of Science could enrich bibliographic data. Finally, combining bibliometric analysis with systematic literature reviews could provide a deeper understanding of the analyzed topic. This approach would allow for a more comprehensive exploration of the research findings and methodologies of AI in art and design education, as well as consideration of the impact of global events and international collaborations.

The integration of AI in art and design education has the potential to be revolutionary, in addition to improving teaching efficiency, it can also stimulate students’ creativity and develop skills such as critical thinking. However, realizing these benefits will require overcoming challenges such as AI-related technology integration, teacher training, copyright and ethical considerations for software, among others.

Next, the research hope to further explore the application of Gen-AI technology in art and design education in the future to promote students’ creativity and design results. The first step is to assess the acceptance and demand of students and teachers for the application of AI

technology. Art and design educators are then encouraged to collaborate across disciplines with relevant experts, such as computer scientists and educational technology, to develop integrated strategies and assessments for cross-disciplinary curricula, while integrating AI technologies into curriculum frameworks, teaching methods, and assessment tools. It should also focus on ethical issues such as data privacy and algorithmic bias. Finally, it is suggested to adopt multi-dimensional, interdisciplinary and long-term research to gradually promote the progress and development of this field.

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### **Institutional Review Board Statement**

Not applicable.

### **Informed Consent Statement**

Informed consent was obtained from all subjects involved in the study.

### **Data Availability Statement**

The data presented in this study are available on request from the corresponding author.

### **Conflicts of Interest**

The authors declare no conflicts of interest.

## References

- Almaz, A. F., El-Agouz, E. A. E.-A., Abdelfatah, M. T., & Mohamed, I. R. (2024). The Future Role of Artificial Intelligence (AI) Design's Integration into Architectural and Interior Design Education is to Improve Efficiency, Sustainability, and Creativity. *Civil Engineering and Architecture*, *12*(3), 1749–1772. Scopus. <https://doi.org/10.13189/cea.2024.120336>
- Ayanwale, M. A., Molefi, R. R., & Oyeniran, S. (2024). Analyzing the evolution of machine learning integration in educational research: A bibliometric perspective. *Discover Education*, *3*(1), 47. <https://doi.org/10.1007/s44217-024-00119-5>
- Baas, J., Schotten, M., Plume, A., Côté, G., & Karimi, R. (2020). Scopus as a curated, high-quality bibliometric data source for academic research in quantitative science studies. *Quantitative Science Studies*, *1*(1), 377–386. [https://doi.org/10.1162/qss\\_a\\_00019](https://doi.org/10.1162/qss_a_00019)
- Barak, M., Watted, A., & Haick, H. (2020). Establishing the validity and reliability of a modified tool for assessing innovative thinking of engineering students. *Assessment & Evaluation in Higher Education*, *45*(2), 212–223. <https://doi.org/10.1080/02602938.2019.1620680>
- Bittencourt, I. I., Chalco, G., Santos, J., Fernandes, S., Silva, J., Batista, N., Hutz, C., & Isotani, S. (2023). Positive Artificial Intelligence in Education (P-AIED): A Roadmap. *International Journal of Artificial Intelligence in Education*. <https://doi.org/10.1007/s40593-023-00357-y>
- Chung, A., He, Y.-C., Lin, L.-F., & Liang, Y.-W. (2024). Importance of Different AI-Generated Journey Map Modules from Industrial Design Students' Perspectives. In Meen T.-H. (Ed.), *IEEE Eurasian Conf. Educ. Innov.: Educ. Innov. Emerg. Technol., ECEI* (0 citation(s); pp. 242–245). Institute of Electrical and Electronics Engineers Inc.; Scopus. <https://doi.org/10.1109/ECEI60433.2024.10510784>
- Dávila Rodríguez, M., Guzmán Sáenz, R., Macareno Arroyo, H., Piñeres Herera, D., de la Rosa Barranco, D., & Caballero-Uribe, C. V. (2009). Bibliometría: Conceptos y utilidades para el estudio médico y la formación profesional. *Revista Salud Uninorte*, *25*(2), 319–330.
- Dove, G., Halskov, K., Forlizzi, J., & Zimmerman, J. (2017). UX design innovation: Challenges for working with machine learning as a design material. *Conf Hum Fact Comput Syst Proc*, *2017-May*, 278–288. Scopus. <https://doi.org/10.1145/3025453.3025739>
- Fleischmann, K. (2024). Generative Artificial Intelligence in Graphic Design Education: A Student Perspective. *Canadian Journal of Learning and Technology*, *50*(1). Scopus. <https://doi.org/10.21432/cjlt28618>

- Huang, K.-L., Liu, Y.-C., Dong, M.-Q., & Lu, C.-C. (2024). Integrating AIGC into product design ideation teaching: An empirical study on self-efficacy and learning outcomes *Learning and Instruction, 92*, 101929. <https://doi.org/10.1016/j.learninstruc.2024.101929>
- Hutson, J. (2024). Integrating art and AI: Evaluating the educational impact of AI tools in digital art history learning. *Forum for Art Studies, 1*(1). <https://doi.org/10.59400/fas.v1i1.393>
- Jung, D., & Suh, S. (2024). Enhancing Soft Skills through Generative AI in Sustainable Fashion Textile Design Education. *Sustainability (Switzerland), 16*(16). Scopus. <https://doi.org/10.3390/su16166973>
- Khodabandelou, R., Fathi, M., Amerian, M., & Fakhraie, M. R. (2022). A comprehensive analysis of the 21st century's research trends in English Mobile Learning: A bibliographic review of the literature. *The International Journal of Information and Learning Technology, 39*(1), 29–49. <https://doi.org/10.1108/IJILT-07-2021-0099>
- Li, J., Liu, S., Zheng, J., & He, F. (2024). Enhancing visual communication design education: Integrating AI in collaborative teaching strategies. *Journal of Computational Methods in Sciences and Engineering, 24*(4–5), 2469–2483. Scopus. <https://doi.org/10.3233/JCM-247471>
- Mishra, M., Dash, M. K., Sudarsan, D., Santos, C. A. G., Mishra, S. K., Kar, D., Bhat, I. A., Panda, B. K., Sethy, M., & Silva, R. M. da. (2022). Assessment of trend and current pattern of open educational resources: A bibliometric analysis *The Journal of Academic Librarianship, 48*(3), 102520. <https://doi.org/10.1016/j.acalib.2022.102520>
- Omran Zailuddin, M. F. N., Nik Harun, N. A., Abdul Rahim, H. A., Kamaruzaman, A. F., Berahim, M. H., Harun, M. H., & Ibrahim, Y. (2024). Redefining creative education: A case study analysis of AI in design courses. *Journal of Research in Innovative Teaching and Learning*. Scopus. <https://doi.org/10.1108/JRIT-01-2024-0019>
- Radcliffe, D. F., & Holt, J. E. (1984). REVIEW OF DESIGN EDUCATION METHODS AND THE FUTURE ROLE OF CAD. *International Journal of Mechanical Engineering Education, 12*(4), 275–280. Scopus.
- Samaniego, M., Usca, N., Salguero, J., & Quevedo, W. (2024). Creative Thinking in Art and Design Education: A Systematic Review. *Education Sciences, 14*(2), Article 2. <https://doi.org/10.3390/educsci14020192>
- Singh, D. R. J. (2023). Transforming Higher Education: The Power of Artificial Intelligence. *International Journal of Multidisciplinary Research in Arts, Science and Technology, 1*(3), Article 3.
- Southgate, E., Blackmore, K., Pieschl, S., Grimes, S., McGuire, J., & Smithers, K. (2019). *Artificial intelligence and emerging technologies in schools: Research report*. University of Newcastle.

- Tapalova, O., & Zhiyenbayeva, N. (2022). Artificial Intelligence in Education: AIED for Personalised Learning Pathways. *Electronic Journal of E-Learning*, 20(5), 639–653.
- VOSviewer—*Visualizing scientific landscapes*. (n.d.). VOSviewer. Retrieved September 7, 2024, from <https://www.vosviewer.com/>
- Xu, W., & Ouyang, F. (2022). A systematic review of AI role in the educational system based on a proposed conceptual framework. *Education and Information Technologies*, 27(3), 4195–4223. <https://doi.org/10.1007/s10639-021-10774-y>
- Yu, D., Ding, M., & Li, W. (2020). Designing an Artificial Intelligence Teaching Service to Assist University Student in Art and Design to Develop a Personal Learning Experience. In *Education and Awareness of Sustainability: Vol. Volume 3* (pp. 293–296). WORLD SCIENTIFIC. [https://doi.org/10.1142/9789811228001\\_0066](https://doi.org/10.1142/9789811228001_0066)
- Zhang, Z., Chen, H., Huang, R., Zhu, L., Ma, S., Leifer, L., & Liu, W. (2024). Automated Classification of User Needs for Beginner User Experience Designers: A Kano Model and Text Analysis Approach Using Deep Learning. *AI*, 5(1), 364–382. <https://doi.org/10.3390/ai5010018>