Mapping the Research Landscape of Generative AI in Art Design Education: A Bibliometric Review Using CiteSpace

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Abstract: ***This bibliometric study systematically maps the integration of generative artificial intelligence (GenAI) into art and design education curricula by analyzing 6,098 peer-reviewed papers indexed in the CNKI and Web of Science (WOS) core databases from 2014 to 2024, employing CiteSpace for co-occurrence and cluster visualization. The findings reveal a pronounced inflection point around 2019, coinciding with the advent of large-scale diffusion and transformer models, after which the field entered a phase of exponential expansion; notably, the annual growth rate of international publications has consistently outpaced domestic outputs, reflecting a faster academic uptake in Western institutions despite China's aggressive AI infrastructure investments. Regarding publication venues, WOS-distributed literature spans a highly dispersed matrix across computer science, educational technology, and human-computer interaction journals, whereas CNKI contributions remain markedly concentrated in higher education and vocational pedagogy periodicals, indicating a domestic emphasis on curricular delivery rather than algorithmic innovation. Institutional leadership is overwhelmingly concentrated in regions with mature AI ecosystems—such as California, the Yangtze River Delta, and the Pearl River Delta—where top-tier Chinese universities have demonstrated publication outputs and citation impacts that achieve international parity. However, collaboration network topology exposes a persistent structural asymmetry: domestic cooperations exhibit low density (density < 0.03) and intense regional clustering, whereas international networks display extensive transcontinental connectivity and robust interdisciplinary bridging. On the practical front, GenAI applications—exemplified by Midjourney, DALL-E 3, and Stable Diffusion—are revolutionizing digital course resources by enabling rapid visual prototyping, personalized style-transfer tutorials, and adaptive feedback systems, which collectively enhance instructional throughput. For instance, a controlled pedagogical experiment at the China Academy of Art (2024) reported a 40% reduction in conceptual iteration time among undergraduate product-design cohorts when using GenAI co-pilots, while parallel trials at Stanford's d.school indicated that AI-generated critique prompts improved novice students' composition awareness by 28% over a semester. Concurrently, the literature consistently foregrounds critical risks that temper this optimism. First, originality concerns have escalated, with a 2023 survey of 156 U.S. design educators revealing that 72% perceived increased plagiarism ambiguities tied to AI-facilitated output. Second, algorithmic bias remains underexplored yet pervasive: empirical audits of popular text-to-image models have shown systematic overrepresentation of Western aesthetic canons, threatening to homogenize global design education. Third, academic ethics—ranging from authorship attribution to data privacy in student-uploaded portfolios—pose unresolved governance dilemmas. Collectively, these results underscore a dual-edged reality: while GenAI substantially enriches pedagogical infrastructure and cognitive scaffolding in art-design training, its responsible adoption hinges critically on constructing robust ethical guardrails, debiasing training pipelines, and redefining human-AI creative symbiosis, all of which demand immediate policy and curricular interventions to prevent technological determinism from overshadowing educational equity and authentic creativity.***

Keywords: Generative Artificial Intelligence (GenAI), Art and Design Education, Bibliometric Analysis, CiteSpace, Curriculum Resources, Academic Ethics, Algorithmic Bias, Human-AI Collaboration.

1. INTRODUCTION

Artificial Intelligence Generated Content (AIGC) refers to a technology that, based on specific models and algorithms, can simulate and master data patterns through deep learning of massive amounts of raw data (such as text, audio, images, etc.). When it receives a user’s "prompt" or "instruction", it can automatically generate new data that is similar in characteristics to the raw data but with entirely new content. In the field of art design, it is mainly embodied in key technologies such as text-to-image, image-to-image, and image-to-video. The "White Paper on Artificial Intelligence Generated Content (AIGC) of China Academy of Information and Communications Technology" defines the concept of Artificial Intelligence Generated Content (AIGC) [1], and at the same time points out that artificial intelligence generated content is the process of using artificial intelligence technology to automatically generate digital content such as text, images, audio, and video. Generative artificial intelligence tools represented by ChatGPT, Mid-journey, Stable Diffusion, etc. abroad and Doubao, DeepSeek, Jimeng, Keling, Zhipu Qingyan, iFlytek Spark, etc. in China are emerging continuously. The practice of artificial intelligence education needs to adhere to the four principles of putting people first, promoting educational fairness,

ensuring safety ethics and effectiveness, and enhancing transparency, providing guidelines for the integration of technology and education that take into account individual development, fair quality, and safety and transparency. Although the discussion of AIGC in art design education is increasing day by day, the research context, core themes, and cooperation patterns in this field still lack systematic and visual sorting. Therefore, this study uses bibliometric methods to scientifically reveal its development trend and frontier hotspots, providing a reference coordinate for subsequent research.

2. DATA SOURCES AND RESEARCH METHODS

2.1 Data Sources and Retrieval Strategies

This study followed the norms of systematic literature review to conduct literature collection, screening, and analysis. The core databases of China National Knowledge Infrastructure (CNKI) and Web of Science (WoS) were used as the retrieval platforms, and the published academic papers were taken as the research objects. A total of 6,098 domestic and foreign literatures from 2014 to 2024 were selected, including 1,788 in the CNKI database and 4,310 in the WoS core database, and the data analysis and induction of the research topics were carried out on them. Given the multi-dimensional characteristics of the concept of artificial intelligence, the study uniformly set "artificial intelligence", "AIGC", and "AI" as the core retrieval terms; for the directions of curriculum construction, talent cultivation, and art design concerned by the vocational education circle in the social science field, the related keywords "curriculum", "art design", and "education" were set simultaneously.

The specific retrieval strategies are as follows: In the CNKI database, the combination condition of "Subject=(Artificial Intelligence+AIGC+AI)*(Curriculum+Art Design+Education)" was used for retrieval. At the same time, the literature classification was limited to the categories of higher education, secondary education, vocational education, adult education, and special education under "Social Sciences II", and the journal sources were screened for SCI, EI, Peking University Core, and CSSCI-indexed journals. After duplicate removal, 1,788 Chinese literatures were obtained. In the WoS core database, considering that simply using "Education" as the keyword might result in an excessive number of English literatures, the following retrieval expression was used: Subject=(AIGC OR AI OR Artificial Intelligence) AND (Course OR Art Design). At the same time, the literature type was limited to Article or Review, the language was English, and the time span was 2014-2024. Finally, 4,310 English research papers were retrieved.

The retrieval process followed the principle of multi-dimensional keyword combination and discipline scope limitation. In the CNKI database, "artificial intelligence" or "AIGC" or "AI" was used as the technical keyword, and "curriculum", "art design", and "education" were crossed as the educational scenario keywords. At the same time, the literature classification was limited to the fields of higher education and vocational education in "Social Sciences II", and the SCI, EI, and core journal sources were screened to ensure the literature quality. In the WoS database, considering the large number of English literatures, the retrieval formula of "Subject=(AIGC OR AI OR Artificial Intelligence) AND (Course OR Art Design)" was used. At the same time, the literature type was limited to Article or Review, the language was English, and the time span was 2014-2024. Finally, a total of 6,098 Chinese and English literatures were obtained. This strategy not only covered the cross-field of technology and education but also enhanced the academic representativeness of the literature through the database screening criteria. At the same time, in the WoS retrieval of this paper, the keyword "Education" was excluded due to the large amount of literature, which might lead to a certain range deviation in the comparison of Chinese and English literatures.

2.2 Research Tools and Analysis Pathways

The CiteSpace software is used for literature mining. The core analysis dimensions include: Time series analysis: Set the time slice to 1 year, and draw a graph of the publication volume trend from 2014 to 2024 with "Year Published" as the node, visually presenting the phased characteristics of domestic and foreign research (such as the explosive growth of foreign research after 2019). Journal and institution distribution maps: With "Source" and "Institution" as the node types, simplify the network through the "Pathfinder" algorithm to identify highly influential journals (such as《ENGINEERING AppLICATIONS OF ARTIFICIAL INTELLIGENCE》) and core research institutions (such as the University of California, Tsinghua University), and compare the differences in journal concentration and institution geographical distribution between domestic and foreign. Collaboration network analysis: Generate a visualization map through the "Institution Co-occurrence" function. The size of the node represents the publication volume, and the thickness of the connection line reflects the collaboration intensity. Domestic institution collaboration shows the characteristic of "urban agglomeration" (such as East China Normal

University and Shanghai Vocational College of Art and Design), while foreign institution collaboration forms a cross-country and interdisciplinary linkage network (such as the collaboration between Harvard University and University College London).

3. ANALYSIS OF THE RESEARCH PROCESS

The retrieval deadline for the literature data in this study was September 30, 2024. The CNKI and WOS data covered the period from January 1, 2014 to September 30, 2024. Through the analysis of the retrieved data, it was found that the academic achievements in the cross - field of artificial intelligence, courses, and art design showed a continuous growth trend. As shown in Figure 1, 2019 became the key node for the change in research heat. Since then, the growth rate of foreign research results has significantly exceeded that of domestic ones. Based on this, the research process in this field was divided into two stages: The first stage (2014 - 2019), the overall output of research results was relatively low, and the growth curves at home and abroad were relatively flat, indicating that the impact of artificial intelligence on curriculum and art design teaching had not yet attracted widespread attention from the academic community; The second stage (2019 - 2024), significant growth occurred in research results both at home and abroad, especially the number of foreign literature showed an exponential growth trend. With the deep application of artificial intelligence technology in scenarios such as educational digital transformation, vocational education reform, and design innovation, the research heat in this field continued to climb, and foreign research institutions demonstrated stronger initiative and innovation vitality in the output of results.

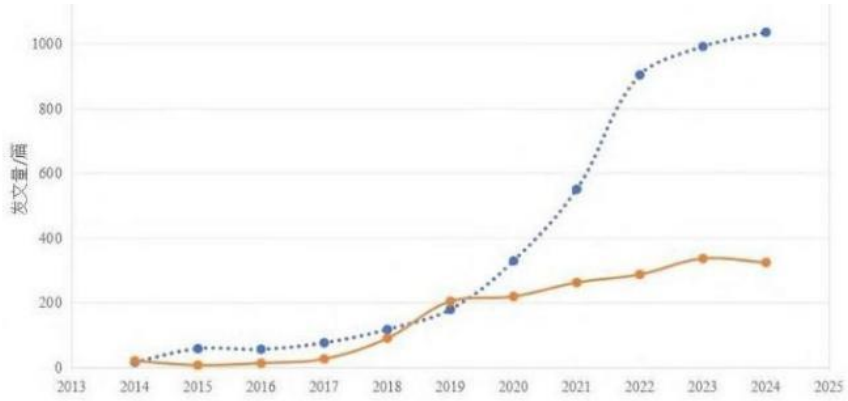

Figure 1: Annual Publication Volume Trend Chart of AIGC and Art Design Courses in the Core Databases of CNKI and WOS from 2014 to 2024

4. DISTRIBUTION OF PUBLISHED JOURNALS AND RESEARCH INSTITUTIONS

According to the results of bibliometric analysis, the academic papers included in the Web of Science database show a relatively scattered distribution. Among them, "ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE" ranks first with 33 articles, and the average number of articles published in the top 10 journals is 16.75. In sharp contrast, the literature distribution in the China National Knowledge Infrastructure (CNKI) database shows a significant concentration (see Figure 2). The average number of articles published in its top 10 journals is as high as 57.4, and higher education and vocational education journals such as "Research in Higher Education of Engineering" and "Chinese Vocational and Technical Education" occupy a dominant position. It should be noted that professional journals such as "Vocational and Technical Education", "Education and Vocation", and "China Higher Education" have shown a synchronous growth trend in the number of papers published in this field in recent years, and the numbers are roughly balanced. In addition, 14 other core education journals have continuously published relevant research results, and the number of articles published in each of them remains around 20. This fully demonstrates that artificial intelligence research has attracted extensive attention and in-depth analysis in various sub-disciplines of the education field.

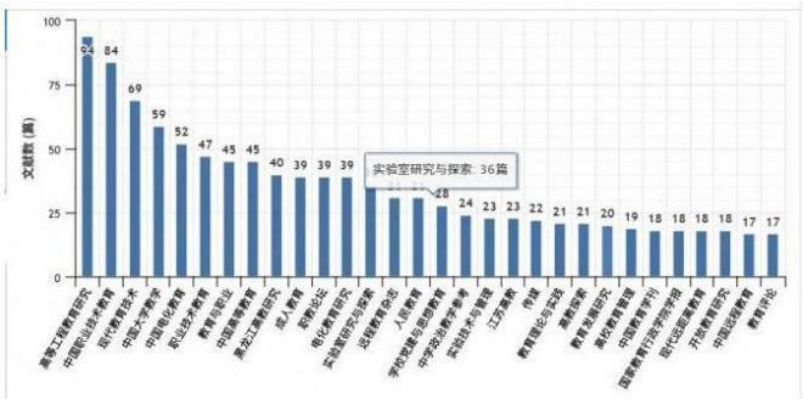

Figure 2: Statistical Chart of the Number of Articles Published in CNKI Journals

Analyzing the distribution of the top 10 research institutions in terms of the number of articles published at home and abroad (see Table 1), it is found that foreign institutions are mainly concentrated in countries such as the United States and the United Kingdom, while domestic institutions are mostly distributed in provinces and cities such as Beijing, Tianjin, Zhejiang, Shanghai, and Wuhan. These regions, relying on their own development advantages in the field of artificial intelligence technology, provide strong foundation support for local research in the field of artificial intelligence. It should be especially noted that Tsinghua University, Zhejiang University, the Chinese Academy of Sciences, etc. have a relatively high number of articles published in domestic and international Chinese and English core journals, indicating that the relevant academic research of domestic top universities in the field of artificial intelligence has also reached a comparable international level.

Table 1: Statistical Table of the Number of Articles Published on Artificial Intelligence and Art Design Courses by Institutions at Home and Abroad from 2014 to 2024

Serial number	Institution name	Number of publications in WoS	Institution name	Number of publications in CNKI
1	University of California System (University of California)	97	East China Normal University	69
2	University of London (University of London)	81	Beijing Normal University	62
3	Chinese Academy of Sciences (Chinese Academy of Sciences)	79	Zhejiang University	51
4	Harvard University (Harvard University)	57	Southwest University	43
5	Tsinghua University (Tsinghua University)	55	Tianjin University	40
6	State University System of Florida (Florida State University)	48	South China Normal University	36
7	Zhejiang University (Zhejiang University)	46	Central China Normal University	35
8	University College London (University of London)	45	Tsinghua University (Tsinghua University)	30
9	University System of Georgia (University of Georgia)	45	Renmin University of China	29
10	University of Texas System (University of Texas)	44	Beijing Institute of Technology	28

5. COLLABORATION NETWORK ANALYSIS

Based on the constructed literature database, collaboration network diagrams of major domestic and foreign research institutions and authors were drawn (as shown in Figures 3 to 4). In the diagrams, nodes represent institutions or authors, and their size is positively correlated with the number of published papers, that is, the larger the node, the more papers are published; when the nodes are presented in the form of annual rings, the bandwidth of a certain color band reflects the number of papers published by an author in that year, and the more papers are published, the wider the bandwidth of the annual ring; the connections between nodes represent the collaboration relationships between institutions or authors, and the thickness of the connections reflects the degree of collaboration tightness. By comparing Figure 3 and Figure 4, it can be seen that the collaboration network density of domestic research institutions is lower than that of foreign institutions, and the geographical coverage of collaboration is more limited. Domestic institutions usually collaborate among different universities in the same city or different research institutes in the same university. For example, there is close collaboration among the Faculty of Education of East China Normal University, the School of Educational Science and Technology of

Nanjing University of Posts and Telecommunications, the School of Education of Nanjing Normal University, and the Faculty of Education of Southwest University. There is also collaboration with institutions in the same city, such as the cooperation between Shanghai Institute of Art and Design and East China Normal University. In contrast, the collaboration geographical scope of foreign institutions is significantly wider, covering cross-regional collaborations within the same country. For example, institutions such as the University of California, Harvard University, University of London, University of Texas, Imperial College London, and National University of Singapore have relatively frequent collaborations.

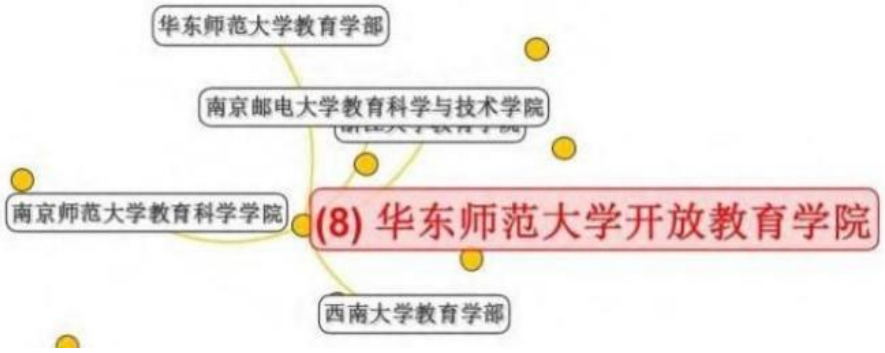

Figure 3: Collaboration Network Diagram of Domestic Research Institutions in Artificial Intelligence from 2014 to 2024

In comparison, the collaboration network connectivity of foreign research institutions is stronger, building a global collaborative pattern that transcends national boundaries, while the domestic collaboration network shows relatively prominent geographical segmentation characteristics, forming several relatively independent sub-networks. At the same time, close collaboration between institutions has been proven to be the key to obtaining cutting-edge dynamics, achieving resource sharing, and accelerating exploration in the field. Strengthening the networked collaboration among domestic research institutions is the key path to promoting the future development of our country in this field.

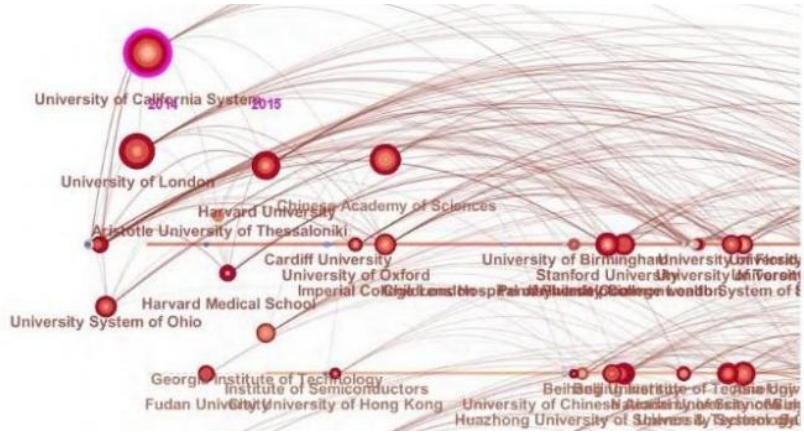

Figure 4: Collaboration Network Diagram of Foreign Research Institutions in Artificial Intelligence from 2014 to 2024

6. ANALYSIS OF RESEARCH HOTSPOTS

Systematic comparative research on domestic and foreign academic literature shows that the application of generative artificial intelligence technology in the construction of digital curriculum resources in the field of vocational art education presents a multi-dimensional research trend, and its research hotspots focus on key areas such as the innovation of teaching models, the development of curriculum resources, the cultivation of creative abilities, and ethical and copyright challenges.

6.1 Innovation of Teaching Models

With the deep involvement of generative artificial intelligence technology, the field of art and design education in vocational colleges is undergoing a structural change in the teaching paradigm. The research by Wang Tan [2]

points out that to achieve an accurate fit between the cultivation of digital art and design talents and industrial needs, it is necessary to synergistically integrate the school-enterprise cooperation practice curriculum system and the artificial intelligence tool training system. At present, some higher education institutions and scientific research institutes in China have carried out innovative application research on AIGC technology in art and design teaching. By introducing intelligent auxiliary design systems, the generation efficiency and optimization level of design schemes have been significantly improved. Taking Wuhan Polytechnic University as an example, the fashion design major of this school uses the STYLE3D artificial intelligence platform to carry out prototype generation teaching practice. Empirical data shows that the efficiency of students' assignments has increased by more than 15%, achieving the intelligent and rapid update of clothing styles. This dual-track teaching model that integrates "intelligent data analysis" and "virtual simulation operation" has improved students' data literacy and cultivated their innovative thinking ability.

6.2 Curriculum Resource Development

In recent years, the application of generative artificial intelligence technology in the resource development of art and design education has attracted increasing attention from the academic community. The research by Duan Yongjie et al. [3] shows that artificial intelligence-generated content technology can improve the production efficiency and diversity of digital content. This feature provides a new technical approach for the development of art and design curriculum resources and has unique advantages in aspects such as the construction of design template libraries and the establishment of stylized material libraries. However, it is also necessary to pay strict attention to the quality of content to prevent the problem of resource homogenization. Taking the practice of the Shandong University of Arts as an example, the school has deeply integrated AIGC technology into the art education system and constructed an innovative education paradigm of "artificial intelligence + design". The specific measures include setting up a special artificial intelligence design research institution, developing a characteristic curriculum group that includes a general course on the introduction to artificial intelligence and more than a dozen AIGC professional courses, and compiling a series of professional textbooks. In terms of the construction of the teaching staff, the school strives to build a composite teaching team with both digital media technology and artificial intelligence knowledge. Practice has proved that generative artificial intelligence technology presents application value and development potential in the development of art and design curriculum resources in vocational colleges, can effectively improve the quality level and diversity degree of teaching resources, and also provides rich possibilities for educational and teaching innovation.

6.3 Cultivation of Creative Ability

Introducing generative artificial intelligence technology into the field of art design education in vocational colleges plays an important supporting role in the cultivation of innovative talents. Taking the practice of Suzhou Art & Design Technology Institute as an example, the school integrated AIGC toolchains such as Deep-Seek, Kelin, and Jimeng, and built a hierarchical curriculum reform system. Its AIGC Art Creation and R & D Center also obtained the qualification of the first batch of generative AI in-depth application project cooperation units by the Ministry of Industry and Information Technology. This "artificial intelligence +" teaching model has achieved good practical results. The students of this school won the gold medal in the short video creation and operation competition of the 2024 World Skills Competition for Vocational Colleges. The research by Liu Haiming [4] shows that the imitation characteristics of AIGC may have a potential impact on originality. In teaching practice, it is necessary to clearly define the boundaries between imitation and originality, and guide students to use AI tools critically to stimulate unique creativity. Practice has proved that AIGC technology can not only help students master the basic design theory, but also effectively improve their innovative thinking and practical ability through practical links.

6.4 Ethical and Copyright Challenges

The generative artificial intelligence technology has been continuously integrated into the digital process of art and design education, showing innovative value and transformative potential in the development and application of curriculum resources. Taking the AIGC special training held by the Department of Art and Design of Shandong Vocational College of Clothing as an example, this practice focused on exploring the reconstruction of educational subjects triggered by the entry of artificial intelligence into the teaching field, such as core issues like the transformation of teachers' roles and the boundaries of intellectual property protection, and strived to achieve the dialectical unity of technological innovation and the essence of education. The research by Liu Bin et al. [5] further pointed out that there are disputes over the copyright ownership of AIGC-generated works, art in the design of digital courses, it is necessary to clarify the copyright boundary of students' use of AI-generated content, establish

a copyright distribution mechanism for "human-machine collaborative creation", and strengthen ethical education to avoid infringement risks. In the educational transformation promoted by AIGC technology, copyright protection and ethical norms constitute an interrelated systematic issue, which requires educational institutions, academic organizations, and regulatory departments to jointly establish the ownership recognition standard for "human-machine collaborative creation" and avoid potential academic misconduct risks by strengthening the construction of ethical courses.

7. CONCLUSIONS AND OUTLOOK

This study uses CiteSpace visual analysis to conclude that the research on AIGC in the field of art and design education has entered a rapid development stage since 2019. International research dominates in terms of the number of published papers and the breadth of cooperation. Even though top domestic universities are involved, the cooperation network still shows localized characteristics. The research hotspots mainly focus on key areas such as the innovation of teaching models, the development of curriculum resources, the cultivation of creative abilities, and ethical and copyright challenges. Although CiteSpace can present the research trend in a quantitative way, there are still three limitations: First, in terms of data coverage, grey literature is not included, which may lead to an incomplete analysis of on-the-ground application scenarios; Second, in terms of in-depth text mining, keyword co-occurrence analysis is difficult to fully grasp the differences in the theoretical frameworks of the literature, and qualitative analysis needs to be supplemented by manual intensive reading; Third, in terms of cross-language comparison bias, there are semantic differences in the search terms of Chinese and English literature (e.g., "art design" corresponds to multiple expressions in English such as "Art Design" and "Design Education"), which may affect the accuracy of cross-country comparisons.

Future research can further focus on the construction of an ethical framework for the application of AIGC in art and design majors, aiming to provide systematic guidance for the compliance and moral boundaries of technology applications in this field; it can deeply explore an effective evaluation system for students' originality and innovation abilities in the context of AIGC assistance to improve the quality monitoring mechanism of technology-enabled education; it can also analyze the causes of the "island" phenomenon in the domestic research cooperation network and propose practical ways to break the deadlock, providing theoretical reference for promoting cross-domain collaborative research.

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