

Research Hotspots and Trends in Aesthetic Education over the Past 30 Years——A Quantitative Analysis of Literature Based on CiteSpace in WoS and CNKI

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ARTICLE INFO

Received: 26 Dec 2024

Revised: 14 Feb 2025

Accepted: 22 Feb 2025

ABSTRACT

Introduction: Against the backdrop of educational digitalization and the leap forward in quality-oriented education, aesthetic education research has been continuously gaining momentum, yet it lacks a macroscopic quantitative framework.

Methods: This paper employs CiteSpace to conduct co-occurrence, clustering, and burst detection analyses on 909 Chinese and English literatures indexed in Web of Science and CNKI from 1995 to 2025, systematically revealing the global knowledge structure and evolutionary trajectory of aesthetic education.

Results: The results indicate that the development of aesthetic education can be divided into four stages: "idea foundation – practice deepening – policy driving – crisis expansion". The research focuses on four major themes: "theory and practice, policy and social responsibility, talent cultivation and evaluation, technological innovation and interdisciplinary integration", with five emerging frontier directions: "technological empowerment, global collaboration, equity in aesthetic education, social responsibility, and literacy integration". The focus of aesthetic education has expanded from traditional art teaching to the integration of AI/VR, educational equity, and humanistic care.

Conclusions: The constructed cross-corpus knowledge graph provides a quantitative basis for policy-making, curriculum reform, and cross-civilization cooperation, and also points out the direction for the future transformation of aesthetic education paradigms characterized by technology-driven approaches and value co-creation.

Keywords: Aesthetic Education, Art Education, aesthetic education policy, CiteSpace, Bibliometrics

INTRODUCTION

In the contemporary era where the waves of globalization and digitalization converge, aesthetic education is widely regarded as a key pathway to promoting the all-round development of individuals and the progress of social civilization (Shevtsova et al., 2023). UNESCO, in *Rethinking Education* (2015), emphasizes that future education should go beyond knowledge transmission and focus on cultivating the four-dimensional competencies of "learning to know, learning to do, learning to live together, and learning to be". China has also elevated "nurturing people through beauty and cultivating character with aesthetics" to a national strategy through the *Opinions on Comprehensively Strengthening and Improving School Aesthetic Education in the New Era* (Ministry of Education, 2020). Given the demand for "soft skills" such as creativity, emotional intelligence, and cross-cultural understanding, the importance of aesthetic education has become increasingly prominent.

Despite academic progress in policy analysis (Yi 2025), social responsibility (Elliott et al., 2016), and interdisciplinary practice (Eisner 2003), three gaps remain: first, a lack of macro quantitative mapping—traditional reviews, mostly qualitative, hardly reveal the evolution of knowledge structures (Qin et al., 2020); second, insufficient Sino-Western

dialogue—existing studies often focus on partial practices (Xu 2021) or use single-language corpora (Mark 1999), failing to compare East-West differences in focus (Tao et al., 2024); third, delayed capture of frontiers—the evolution of hotspots and their internal logic remain unclear (Jiang et al., 2018), with subjective judgments easily limited by samples (Almufarreh & Arshad 2023; Wang et al., 2024).

To address these gaps, this paper uses CiteSpace (Chen 2004, 2006) to conduct quantitative and visual analysis on 909 aesthetic education papers from Web of Science and CNKI (1995–2025), focusing on four core questions: ① developmental stages of global aesthetic education research; ② temporal changes in research focuses and hot topics; ③ similarities, differences and complementarities between Chinese and Western research paradigms; ④ most promising future research frontiers. The study maps the global knowledge graph of aesthetic education, identifies four themes—"theory and practice", "policy and social responsibility", "talent cultivation and evaluation", "innovation and interdisciplinary integration"—and pinpoints five frontiers including "technological empowerment", "global collaboration" and "aesthetic education equity".

This study contributes by: overcoming the subjective limitations of traditional reviews through large-sample quantification across databases; systematically revealing the paradigm shift of aesthetic education from "teaching-appreciation" to "technology-innovation-social responsibility"; providing visual evidence and roadmaps for policy-making, curriculum reform and interdisciplinary innovation. In an era where technological revolution reshapes education and civilization faces challenges, this research aims to offer theoretical support and practical reference for the future development of global aesthetic education.

MATERIALS AND METHODS

Figure 1 illustrates the "three-stage" technical roadmap of this study: Stage 1 (left) involves systematic retrieval, cleaning and deduplication of literatures from WoS and CNKI, ultimately retaining 1,448 valid samples; Stage 2 (middle) uses CiteSpace for multi-layer analysis of samples—first conducting descriptive statistics on annual publications, then identifying research hotspots through keyword co-occurrence networks, extracting themes via clustering, and tracking theme evolution with timelines and burst detection; Stage 3 (right) summarizes five future agendas based on the above empirical results: technology-driven innovation in aesthetic education paradigms, construction of a global aesthetic education community, resource balancing mechanisms, social responsibility of aesthetic education, and integrated aesthetic education vision for comprehensive literacy. The three stages are connected by arrows, highlighting the progressive logic of "data collection → knowledge discovery → forward-looking insights".

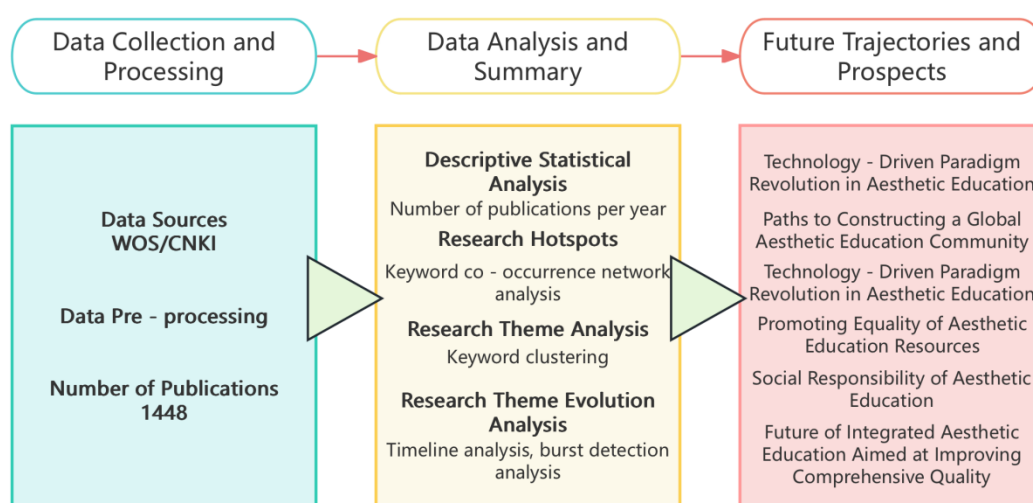


Figure 1. Technology Roadmap

2.1 Methodology:

This study applies bibliometrics and uses CiteSpace 6.4 R1 for visual analysis of aesthetic education literatures from WoS and CNKI (1995–2025). The software employs spectral clustering algorithms to construct maps of author collaboration, institutional networks, keyword co-occurrence and bursts, dynamically revealing research hotspots and contexts (Chen 2004; Shapiro 2010; Jayasree & Baby 2019). Its effectiveness has been verified in scientific mapping and educational research (Chen 2006, 2017; Shen et al. 2022). Previous studies show CiteSpace can accurately depict interdisciplinary features and theme evolution (Zou et al. 2022) and improve Chinese literature analysis quality via algorithm upgrades (Jia et al. 2020). This study also uses burst detection to capture emerging trends like "digital transformation" and "cultural identity", overcoming the subjective limitations of traditional reviews (Oladinrin et al. 2021) and providing empirical support for explaining aesthetic education knowledge structures, predicting frontiers and optimizing resource allocation.

2.2 Data source:

Using CiteSpace 6.4 R1, this study conducted parallel searches on Web of Science (SCI/SSCI) and CNKI (CSSCI/Peking University Core). With "aesthetic education" as the subject term (TS), the search was conducted on 2025-04-12, covering 1995-2025 (with emphasis on post-2015 literatures), limited to "Article" in Chinese and English. All relevant records and their references from both databases were exported. After preprocessing for duplication and completeness, 909 high-quality samples were retained (236 from WoS, 673 from CNKI), providing a solid data basis for subsequent hotspot and trend analysis (Table 1).

Table 1. Publication Extraction Procedure

Data Source	Input Variables
Web of Science	((TS = (Aesthetic Education)))
CNKI	((TS = (Aesthetic Education)))
Limiters	LA = (English) AND DT = (Article)

Note: * refers to any character group, including null characters. TS stands for Topic Search, LA for Language, DT for Document Type.

RESULTS

3.1 Descriptive Statistical Analysis:

From 1995 to 2025, Chinese and English literatures on aesthetic education showed a three-stage trend: "low base - steady growth - rapid rise in recent years" (Figure 2). In the early period (1995-2010), annual publications in both databases were less than 70, with WoS often lingering in single digits and CNKI stably maintaining around 60. A turning point emerged in 2015: WoS jumped to 29, and CNKI rose to 65. Driven by both the pandemic and policies from 2020 to 2024, the growth in both databases was most significant - 93 in WoS and 184 in CNKI, far exceeding historical peaks. The 2025 data is a temporary figure for the first quarter (18 in WoS, 55 in CNKI), and the upward trend is expected to continue by the end of the year. Overall, Chinese academic output has long been leading, and global attention has increased rapidly simultaneously, confirming that aesthetic education research has entered a period of accelerated expansion.

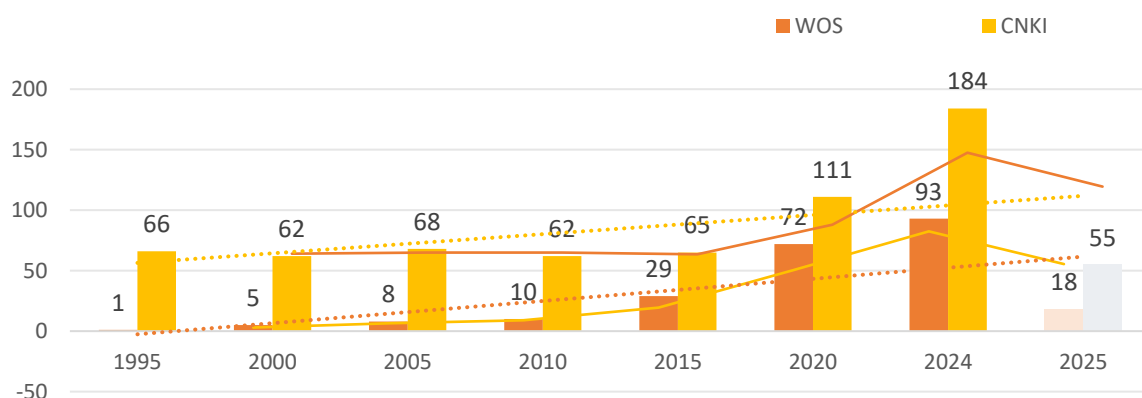


Figure 2. Annual Publication Trends

3.2 Research Hotspots - Keyword Co-occurrence Network Analysis:

Keyword co-occurrence networks (Figs. 3, 4) were constructed using CiteSpace 6.4.R1: the WoS sub-network contains 337 nodes and 685 connections with a density of 0.0121; the CNKI sub-network has 633 nodes and 768 connections with a density of 0.0038. Node size represents literature influence, and connection thickness indicates co-occurrence intensity (Chen et al., 2010). High-frequency, core words are "aesthetic education", "art education", "aesthetic experience" in WoS, and "aesthetic education", "Cai Yuanpei", "art education" in CNKI. "Aesthetic education" shows high centrality in both databases (0.37/0.53), highlighting its disciplinary hub status; "art education" and "school aesthetic education" also play strong bridging roles.

Centrality, ranging 0–1, measures a term's cross-theme connection strength—the higher the value, the stronger its "linkage" function. Frequency alone may overlook this dimension, so centrality indicators in Tables 2 and 3 should be considered: e.g., "art education" (0.51) runs through sub-networks of curriculum, evaluation and talent cultivation; "school aesthetic education" (0.30) indicates campuses as the main practice venue; while "children" and "experience", though frequent, have limited centrality, covering only partial topics. Overall, keyword co-occurrence reveals the multi-dimensional structure of aesthetic education, interwoven with "core concepts—practice paradigms—policy contexts", laying a data foundation for subsequent hotspot clustering and evolution analysis.

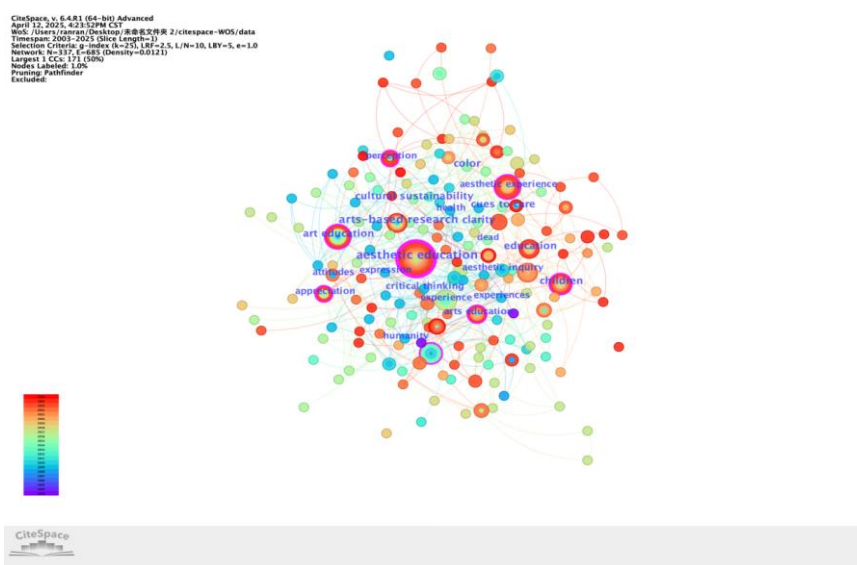


Figure 3. WOS Keyword Co-occurrence Network

CiteSpace v. 5.4.R1 (64-bit) Advanced
April 21, 2025, 8:33:23PM CST
C:\Users\renan\Desktop\毕设数据\CNKI\data
Timespan: 2002-2025 (Slice Length=1)
Selection Criteria: g-index (q=0.25, LRF=2.5, L/N=10, LBY=5, e=1.0)
Network: N=633, E=768 (Density=0.0038)
Largest CC: 485 (76%)
Nodes Labeled: 1.0%
Pruning: Pathfinder
Excluded:

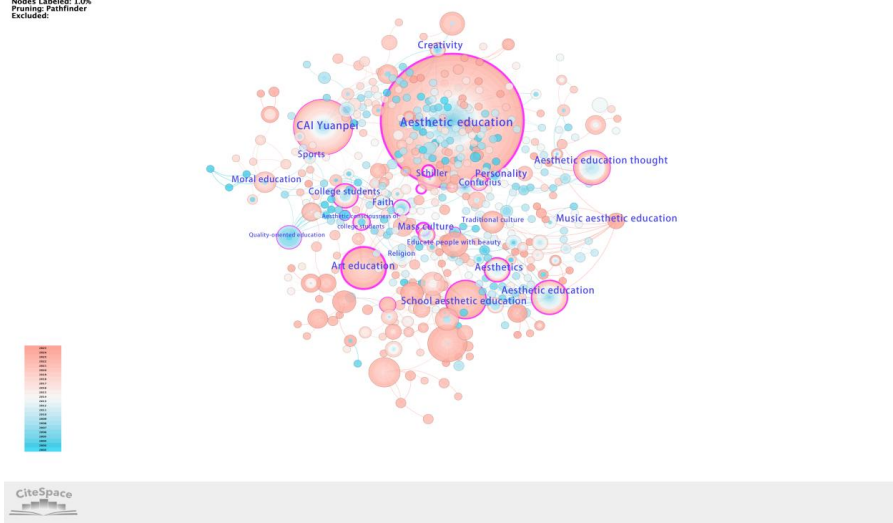


Figure 4. CNKI Keyword Co-occurrence Network

Number	Frequency	Centrality	Keyword
1	18	0.37	aesthetic education
2	7	0.13	aesthetic experience
3	7	0.13	art education
4	6	0.06	experience
5	6	0.07	arts-based research
6	5	0.17	arts education
7	5	0.06	education
8	5	0.11	teacher education
9	4	0.10	children
10	3	0.01	environmental education

Figure 5. The top 10 frequently used keywords in WOS

Number	Frequency	Centrality	Keyword
1	349	0.53	aesthetic education
2	61	0.19	Yuanpei Ca
3	37	0.51	art education
4	29	0.37	school aesthetic education
5	28	0.05	higher education art education
6	27	0.13	aesthetic education thought
7	25	0.28	aesthetic education
8	16	0.03	new times
9	13	0.09	educating people through beauty
10	12	0.06	Schiller

Figure 6. The top 10 frequently used keywords in CNKI

3.3 Research Topic Analysis - Keyword Clustering:

Keyword clustering analysis categorizes keywords into network clusters by calculating their correlation, systematically presenting a discipline's research theme structure. Figures 5 and 6 show high-frequency keyword

clustering knowledge graphs of "aesthetic education" from WoS and CNKI databases, covering high-quality aesthetic education studies from 1995 to 2025, constructed using this method. The excellent clustering performance is verified by two indicators: modularity Q (0.9111 for Fig. 5, 0.8662 for Fig. 6, both far above the 0.7 standard) and silhouette coefficient (0.9705 for Fig. 5, 0.9806 for Fig. 6, both close to 1). With Q values ranging from -1 to 1, those in this study indicate high internal connection density within clusters, sparse inter-cluster connections, and division results significantly better than random distribution (>0.3 is meaningful). Silhouette coefficients far exceed the 0.3 benchmark, confirming high matching between samples and their clusters and ensuring the reliability of clustering results.

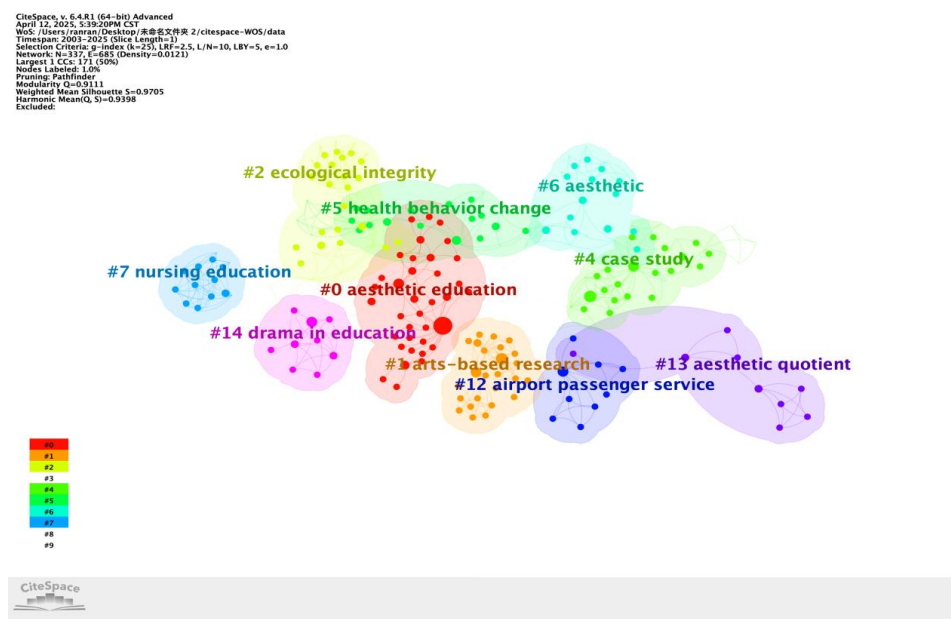


Figure 7. WOS Keyword Clustering Network

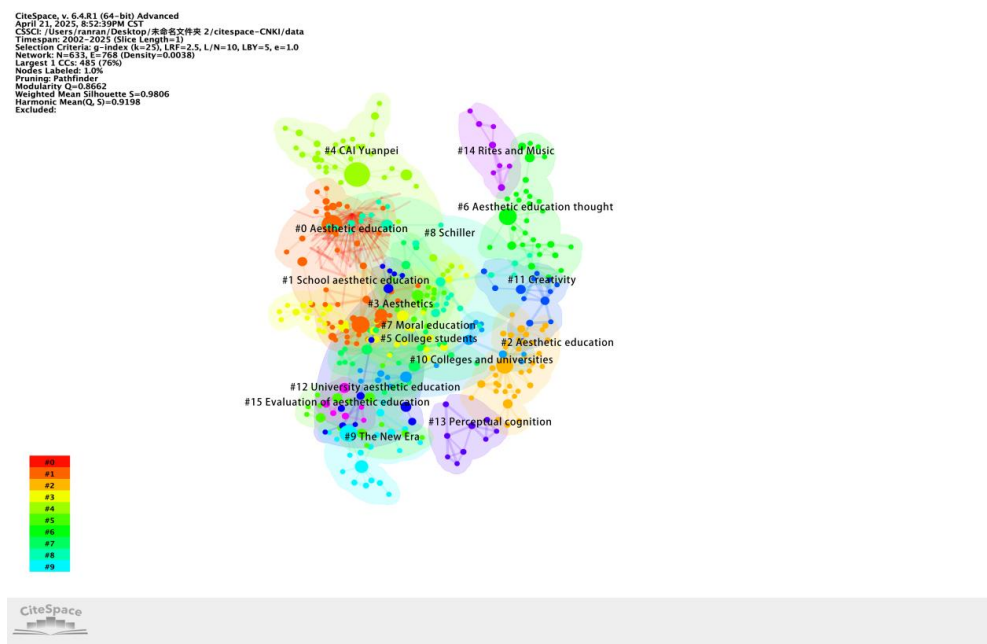


Figure 8. CNKI Keyword Clustering Network

Analysis of the two databases identified 15 clusters each. As shown in Figure 6, they range from #0 "aesthetic education" to #14 "drama education"; Figure 6 also shows #0 "aesthetic education" to #15 "aesthetic education

evaluation". Numbers indicate relative size, with #0 being the largest. In Table 4 and section 3.2, "silhouette value" corresponds to each cluster's silhouette score—a key indicator of clustering quality, reflecting the fit between individual keywords and their cluster. Ranging from -1 to 1, higher values mean better matching between keywords and their cluster, with stronger intra-cluster cohesion. When approaching 1.0, it indicates significantly higher intra-cluster relevance than inter-cluster, serving as an intuitive quantitative basis for judging clustering validity.

This study constructed a keyword clustering feature table via CiteSpace, comprehensively evaluating each cluster's keyword count, silhouette value, average year, and core keyword composition. As shown in Table 4, the average silhouette score (S-value) of 15 clusters in WoS is no less than 0.89; Table 5 shows that of 15 clusters in CNKI is no less than 0.917. Both are significantly higher than the validity threshold, indicating highly reliable clustering results. Silhouette values assess clustering quality by quantifying an object's similarity to its cluster and distinction from others—the closer to 1, the stronger intra-cluster homogeneity and inter-cluster heterogeneity. Current results confirm the clarity and robustness of the clustering structure. These clusters fully cover core issues of aesthetic education, providing theoretical basis for enhancing its competitiveness and operational guidance framework for aesthetic education practice.

In the keyword column, each term is presented as a term frequency (TF)-inverse document frequency (IDF) pair. TF reflects the term's occurrence frequency in a specific cluster; IDF evaluates its discrimination in the entire corpus—lower IDF means more common terms, higher IDF indicates greater specificity. For example, in Table 4, "aesthetic education" has TF 15.35 and IDF 1.0E-4, showing its importance in the research theme group but being a basic term in the entire field.

In network analysis, nodes serve as basic structural units, with their labels forming collective knowledge structures by integrating semantic features of associated keywords. This study generated 14 theme labels (corresponding to 15 research themes) from WoS and CNKI respectively, showing certain conceptual overlaps. Some labels cover research elements of two highly related themes, and this crossover confirms the interdisciplinary nature of relevant fields. This analytical framework not only achieves theme clustering but also explains academic connotations through knowledge network construction, systematically presenting the theoretical breadth and practical depth of aesthetic education research. Subsequent chapters will conduct integrated analysis on research themes from the two databases and interpret each theme module one by one. These modules represent key research directions in the field and reflect its dynamic evolution trajectory, ultimately forming a systematic cognitive framework consistent with the overall research objectives.

(1) Research Theme 1: Art Education and Quality Enhancement

The core value of art education lies in activating students' comprehensive development of "cognition-emotion-will-action" through curriculum systems, workshops, and exhibitions. Studies show that aesthetic experiences can trigger high-level emotions such as awe, wonder, and reverence, which are closely linked to basic abilities like senses, imagination, and critical thinking proposed by Nussbaum (D'Olimpio, 2022). In higher education, public art courses not only enhance humanistic literacy but also significantly promote innovative thinking and cross-cultural understanding (Hou & Liu, 2021; Xu et al., 2024). Meanwhile, the virtue ethics tradition carried by music and narrative arts emphasizes compassion, pity, and care (D'Olimpio, 2021), providing a unique path for students to shape good moral emotions and strengthen their minds. Thus, art education is regarded as an indispensable strategy to address the drawback of "valuing knowledge over creativity" and to build sound personalities and social responsibility.

(2) Research Theme 2: Aesthetic Learning and Sensory Development

The coordinated development of "sensibility-cognition" is a new focus in contemporary aesthetic education research. Neuroscientific evidence shows that aesthetic experiences can significantly enhance emotional intelligence and reduce stress (Minmin & Mo, 2024). Children's initial experience of beauty mostly comes from direct emotional and sensory stimuli, but its later deepening depends on cognitive processing and value judgment; "unconscious learning" in immersive environments bridges the two (Eaude, 2023). Digital new media art, VR painting, and gamified narratives form a "sensation-imagination-creation" loop for adolescents (Greene, 2011). Jennings & Giaccardi (2005) note that creative environments can convert "intangible assets" into social innovation momentum. Thus, aesthetic

learning is not just an emotional regulation tool, but also an important mechanism to stimulate creativity and cultivate a world of meaning.

(3) Research Theme 3: Coordinated Development of Urban-Rural Aesthetic Education Driven by Policies

Under the issue of educational equity, resource allocation and quality improvement of aesthetic education are particularly crucial. Relevant policies continuously narrow the urban-rural gap through three levers: financial subsidies, targeted teacher training, and digital cloud platforms (Opoku Asare & Siaw, 2015). Rural schools are entrusted with the dual mission of "literacy enhancement + cultural revitalization": they should not only improve students' aesthetic appreciation but also activate local intangible cultural heritage and folk customs (Xiong & Zhang, 2025). Ministry of Education documents propose improving hardware conditions in remote areas, co-building aesthetic education resource pools, and establishing teacher supplement mechanisms (Yi, 2024). Moreover, curriculum reconstruction based on local texts and ecological concepts is regarded as the cultural gene for the sustainable development of rural aesthetic education (Yan & Yao, 2024).

(4) Research Theme 4: Public Aesthetic Education Community Development and Cultural Identity

Public art practices at the community level provide residents with an open and shared aesthetic field. Case studies show that projects such as sculpture trails and mural blocks can effectively enhance urban image and reshape local identity (McCarthy, 2006). Integrating folk handicrafts, ethnic music, and festival rituals into community activities can promote the "re-creation" of traditional culture through experience (Karkina, 2018). Public aesthetic education is intertwined with urban economy, technological development, and natural geography, forming a unique "cultural ecosystem" (Kong, 2021), thereby enhancing social cohesion and cultural diversity.

(5) Research Theme 5: Nurturing through Beauty and All-Round Development

Aesthetic education plays a key role in rectifying instrumental rationality and restoring the essence of education. From the perspective of philosophical anthropology, aesthetic training can promote the integrated growth of imagination and emotion (Du & Guo, 2021). Experiments show that students' "flow" experience in art activities is significantly higher than in traditional subjects such as mathematics and science (Csikszentmihalyi, 1997), which is directly related to learning motivation and happiness. Art is called "the language of peace and love," crossing ethnic and cultural barriers through empathetic communication. Thus, aesthetic education is incorporated into the core of high-quality talent cultivation and the "fostering virtue through education" strategy (Gu, 2021), laying the foundation for cultivating a new generation of citizens with global vision, social responsibility, and creative potential.

(6) Research Theme 6: Balancing Standardization and Individualization in Aesthetic Education Evaluation Systems

Evaluating art learning solely by skills and competition results tends to overlook the complexity of aesthetic experience. Experimental aesthetics, neuroimaging, and AI analysis provide technical support for establishing process-oriented and experiential indicators (Zhao & Jing, 2023). Schools are testing multi-dimensional combinations of "standardized rubrics + student self-assessment + digital portfolios" to balance unified benchmarks and individual differences, preventing declining student interest and simplistic teacher evaluation (Du, 2022). Future aesthetic education assessment will focus more on high-level literacy dimensions such as creativity, critical thinking, and value expression.

(7) Research Theme 7: Interdisciplinary Innovation in Art and STEM Education

Amid increasingly complex technological and social challenges, STEAM has become a new paradigm for cultivating interdisciplinary talents. Design thinking connects the rigor of scientific methods and emphasizes art's inquiry into emotions and meanings (Durall et al., 2022). Through projects like programming art, data visualization theater, and 3D-printed intangible cultural heritage patterns, students understand the beauty of algorithms and material logic in practice (Catterall, 2017). This model significantly enhances abilities in problem definition, collaboration, and cross-boundary communication, promoting in-depth integration of disciplinary boundaries.

(8) Research Theme 8: Technology-Enabled Aesthetic Education Research

VR/AR opens immersive experience channels for art history, museum education, and stage practice; AIGC shows great potential in style transfer, auxiliary creation, and interactive narratives. Smart aesthetic education platforms can track learning data in real time and push personalized resources, while the home-school-community co-education network provides cross-field support for aesthetic education activities (Wu & Meng, 2025). Meanwhile, ethical issues—such as algorithmic bias, copyright ownership, and aesthetic homogenization—require balancing the "technology-humanities" tension to ensure technological progress truly serves the improvement of aesthetic value.

Finally, after correlation analysis of secondary themes, this study merges them into four macro clusters, retaining original connotations while highlighting thematic synergy:

- ① Theory and practice of aesthetic education – laying the foundation for art education systems, focusing on coordinated improvement of cognition-emotion-values. Core issues: art education and quality enhancement (using art teaching to address the "valuing skills over literacy" dilemma) and aesthetic learning-sensory development (building progressive paths from perception to creation).
- ② Aesthetic education policies and social responsibility – exploring policy levers for equity and inheritance, promoting disciplinary extension to social fields. Sub-themes include urban-rural aesthetic education coordination (financial inclination, teacher complementarity, school-local collaboration) and public aesthetic education-cultural identity (community art activating local identity).
- ③ Talent cultivation and evaluation systems – verifying the coupling of aesthetic ability and core literacy, emphasizing feedback-driven approaches. Covering nurturing through beauty (sound personality shaping from a philosophical anthropology perspective) and evaluation balancing standards and differences (integrating quantitative indicators and experiential assessment).
- ④ Innovation and interdisciplinary integration in aesthetic education – responding to technological changes and demand for interdisciplinary talents. Focusing on art × STEM (design thinking-driven cross-domain innovation capabilities) and technological empowerment (VR/AR, AIGC expanding aesthetic experiences).

This four-dimensional framework logically aligns with the "dimension reduction" idea of PCA/FA but emphasizes conceptual integration in teaching contexts, aiming to provide a readable and operable research blueprint.

Label	Node	Contour Value	Year	Keywords
0	36	0.958	2018	aesthetic education(15.35,1.0E-4); critical theory (7.57,0.01); arts education (7.57,0.01); music literacy (3.76, 0.1); transdisciplinarity (3.76, 0.1)
1	25	0.985	2013	arts based research(14.82,0.001); art education (9.780,0.005);critical creative pedagogy(4.84, 0.05); music(4.84,0.05); aesthetic emotions (4.84,0.05)
2	22	0.977	2018	innovation (8.28, 0.005); aesthetic design (8.28, 0.005);new technology-based firms(8.28,0.005); design(8.28,0.005); aesthetic education (0.15,1.0)
3	21	1	2016	nursing practice (8.96, 0.005); aesthetic knowing(8.96,0.005); art of nursing(8.96,0.005); aesthetic education(0.11,1.0); arts (0.08,1.0)
4	20	0.993	2019	aggregation function by verbal evaluating (6.5, 0.05);ground staff(6.5,0.05); choice behaviour(6.5,0.05);five-factor personality model(6.5,0.05); aesthetic characteristics(6.5,0.05)
5	16	0.939	2019	decision making(7.78,0.01); core competitiveness(7.78,0.01); patient selection(7.78,0.01);aesthetic quotient (7.78,0.01); gender of doctors(7.78,0.01)
6	14	1	2013	drama in education (11.97,0.001); process drama(11.97,0.001); student active learning(5.9,0.05);dramatisation (5.9,0.05); teacher education (5.9, 0.05)
7	11	0.992	2009	aesthetic aspect (7.78,0.01); fashion design skills (7.780,01); functional aspect(7.78,0.01);augmented reality technology(7.78,0.01); creative aspect (7.78, 0.01)
8	10	1	2007	ecological integrity(6.75,0.01); cultural sustainability(6.75,0.01); river styles(6.75,0.01); landscape aesthetics (6.75, 0.01); new zealand (6.75, 0.01)
9	9	1	2019	qualitative research (5.3,0.05); caring practice (5.3,0.05); hermeneutic(5.3,0.05);empathy(5.3, 0.05);ableism (5.3, 0.05)
10	9	1	2008	case study (11.3,0.001); digital story (5.58, 0.05);aesthetic creativity(5.58,0.05); digital comics (5.580,05);creativity(5.58,0.05)
11	9	1	2018	health behavior change (6.28, 0.05); aesthetic ratings health behavior change(6.28, 0.05); students (6.28, 0.05); healthy landscapes(6.28, 0.05); meaningfulness (6.28, 0.05)
12	9	0.89	2014	evaluation(6.08, 0.05); seed (6.08,0.05); diversity evaluation(6.08, 0.05); research botanic designing (6.08, 0.05);motivation(6.08,0.05)
13	9	0.966	2023	humanities(7.78, 0.01); nursing education (7.78, 0.01);aesthetic inquiry (7.78,0.01); critical thinking (7.78,0.01); arts (4.03, 0.05)
14	9	0.984	2009	think alouds (6.28, 0.05); junior high students (6.28, 0.05); cognitive category (6.28, 0.05); science (6.28,0.05); information seeking (6.28, 0.05)

Figure 9. Summary of WOS Keyword Clustering

Label	Node	Contour Value	Year	Keywords
0	118	1	2013	Aesthetic Education (61.46, 1.0E-4); Aesthetic Education (9.73, 0.005); Aesthetic Education Thought (9.73, 0.005); School Aesthetic Education (9.73, 0.005); Cai Yuanpei (8.63, 0.005)
1	49	0.981	2015	School aesthetic education (42.93, 1.0E-4); Educating through beauty (22.31, 1.0E-4); Art education (20.02, 1.0E-4); Mass culture (13.34, 0.001); Aesthetic consciousness (9.07, 0.005)
2	38	0.985	2013	Universities (15.74, 1.0E-4); Cultural inheritance (14.85, 0.001); Media literacy (14.85, 0.001); Traditional culture (14.85, 0.001); Collaborative education (11.08, 0.001)
3	38	0.948	2009	Creativity (24.87, 1.0E-4); Wang Guowei (9.83, 0.005); Aesthetic Education (8.18, 0.005) Pleasure (8.18, 0.005); Basic Disciplines (8.18, 0.005)
4	36	1	2013	University aesthetic education (21.94, 1.0E-4); talent cultivation (21.94, 1.0E-4); curriculum design (14.56, 0.001); discipline construction (14.56, 0.001); teaching purpose (7.25, 0.01)
5	30	0.917	2014	Empirical cognition (9.51, 0.005); Context (9.51, 0.005); New sensibility (9.51, 0.005); Imagination (9.51, 0.005); Aesthetic experience (9.51, 0.005)
6	30	0.974	2011	Rituals and Music (9.51, 0.005); Music Education (9.51, 0.005); Shao Music (9.51, 0.005); Temperament (9.51, 0.005); Personality Cultivation (9.51, 0.005)
7	25	1	2010	Ecological aesthetic education (19.72, 1.0E-4); Primary school (9.74, 0.005); Ecological ethics (9.74, 0.005); Ecological laws (9.74, 0.005); Laws of beauty (9.74, 0.005)
8	25	0.962	2009	Aesthetic education (51.23, 1.0E-4); Humanities education (12.07, 0.001); Harmonious society (12.07, 0.001); Music aesthetic education (6.73, 0.01); Main topic (6.02, 0.05)
9	21	0.963	2020	Aesthetics (20.68, 1.0E-4); Religion (19.14, 1.0E-4); Belief (19.14, 1.0E-4); Practical significance (12.71, 0.001); Harmony (12.71, 0.001)
10	16	0.958	2015	Cai Yuanpei (51.83, 1.0E-4); Substituting aesthetic education for religion (16.76, 1.0E-4); Contemporary aesthetic education (14.81, 0.001); Aesthetics (12.5, 0.001); Harmonious personality (9.86, 0.005)
11	13	0.997	2012	Undergraduate students (32.11, 1.0E-4); Training (12.71, 0.001); Value orientation (12.71, 0.001); Rural aesthetic education (12.71, 0.001); Aesthetic education course (11.06, 0.001)
12	13	1	2014	Aesthetic education ideology (34.89, 1.0E-4); Life aesthetic education (18.39, 1.0E-4); Personality (12.22, 0.001); Appreciation of civilization (12.22, 0.001); Humanism (12.22, 0.001)
13	9	0.984	2012	Morality Education (19.66, 1.0E-4); Physical Education and Aesthetic Education (13.48, 0.001); Physical Education (13.48, 0.001); Quality Education (9.73, 0.005); Practical Approach (6.71, 0.01)
14	8	0.995	2011	Schiller (23.14, 1.0E-4); Confucius (13.92, 0.001); Aesthetics of Life (13.92, 0.001); Mediation Theory (6.93, 0.01); Aesthetic Game (6.93, 0.01)

Figure 10. Summary of CNKI Keyword Clustering

Main Themes	Description	Sub-themes	Subtopic Description
The Theory and Practice of Aesthetic Education	The core foundation for establishing an aesthetic education system encompasses the multi-dimensional functions of art education in terms of cognitive development, sensibility cultivation, and value formation.	Art education and quality improvement	The study explores the relationship between art education and the improvement of students' qualities. Through the systematic implementation of art education, it enhances students' aesthetic judgment and cultural creativity, thereby breaking the traditional educational predicament of "emphasizing skills but neglecting qualities".
		Aesthetic learning and sensibility development	Emphasize the significance of aesthetic learning for the development of sensibility, and construct an advanced path from "aesthetic perception" to "aesthetic creation"
Art education policy and social responsibility	Focus on policy research related to educational equity and cultural inheritance. The core objective is to promote the transformation of aesthetic education from disciplinary construction to social responsibility practice.	The coordinated development of urban and rural aesthetic education driven by policies	Address the imbalance of aesthetic education resources between urban and rural areas based on policies, and promote cultural empowerment to revitalize education.
		Public Aesthetic Education, Community Development and Cultural Identity	The aim is to extend aesthetic education from schools to public spaces, and through community art projects, to stimulate residents' cultural identity and promote social cohesion.
Personnel cultivation and aesthetic education evaluation	Focus on verifying the correlation between aesthetic ability and core literacy, as well as the feedback optimization function of aesthetic education evaluation for educational goals.	Educating people with beauty and promoting all-round development	The research focuses on verifying the unique value of aesthetic education in perfecting "the essence of human beings" from the perspective of philosophical anthropology. Through aesthetic education, students are guided to form sound values.
		The balance between standardization and individualization in the aesthetic education evaluation system	Explore the optimization of the art quality assessment system and construct an evaluation model that takes into account both unified standards and individual differences.
Artistic Education Innovation and Interdisciplinary Integration	Explore the possibility of innovation in aesthetic education and interdisciplinary integration, with a focus on exploring the potential for innovation in traditional aesthetic education models brought about by technological changes and interdisciplinary convergence.	The interdisciplinary innovation and development of art and STEM education	From a technological perspective, integrating design and scientific thinking into the development of aesthetic education courses can cultivate a comprehensive innovation ability that emphasizes both logic and aesthetics.
		Research on Aesthetic Education Enabled by Technology	Exploring aesthetic education in the era of artificial intelligence, and exploring the path of expanding aesthetic experience through new technologies.

Figure 11. Research Topics and Descriptions in WOS

3.4 Analysis of Research Topic Evolution:

Research frontiers, the most dynamic modules of a discipline, are strategically significant for predicting knowledge growth and disciplinary evolution (Price 1965) and drive the integration of disciplinary boundaries (Porter & Rafols

2009). Tracking keyword trajectories in co-word networks combined with time-series semantic metrics can reveal conceptual evolution and domain transitions (Zupic & Čater 2015). Academia typically identifies highly cited works in a period as frontiers, reflecting collective focus; detection requires parallel analysis of emerging high-frequency terms and networks of highly cited literature. A short-term surge in professional terms often signals directional breakthroughs or technological innovations. Based on this, this paper employs multi-dimensional analysis to predict future key directions of aesthetic education and quality-oriented education.

3.4.1 Timeline Analysis:

With CiteSpace (Figs. 8, 9), hotspots and evolution paths in this field can be visually displayed. Trend graphs are plotted by year (2002–2025), with larger circles indicating more active keywords. After counting annual keywords and constructing relationship networks, it is found that: the network in Fig. 7 contains 337 nodes and 685 connections, with modularity $Q = 0.9111$; the network in Fig. 8 has 633 nodes and 768 connections, with $Q = 0.8662$. Both values far exceed the 0.3 threshold, indicating significant modular structures of the networks.

Figs. 8 and 9 show that keywords like "aesthetic education" and "art education" have color spectra from light to dark, intuitively presenting their trajectories from emergence to maturity. The rising popularity of "aesthetic education" (Eisner 2003) highlights academic consensus on its value in shaping "noble personalities"; steady growth in "art education" research (Bamford 2006) reflects its increasing disciplinary status. Within the core literacy framework, art education has shifted from mere skill training to aesthetic literacy cultivation (Winner et al. 2013), emphasizing imagination, cultural understanding, and creative expression.

Temporal graphs show that core concepts such as "aesthetic education" and "school aesthetic education" remain active long-term; emerging keywords like "perceptual cognition" and "aesthetic education evaluation" have risen rapidly in recent years, reflecting research expansion into education, psychology, and quality assessment. This dynamic analysis not only sorts out history and current status but also provides empirical evidence for predicting disciplinary trends and formulating policies. With digital technology and social cognitive changes, frontiers of aesthetic education research are accelerating into the intersection with intelligent educational technology, fostering more innovative applications.

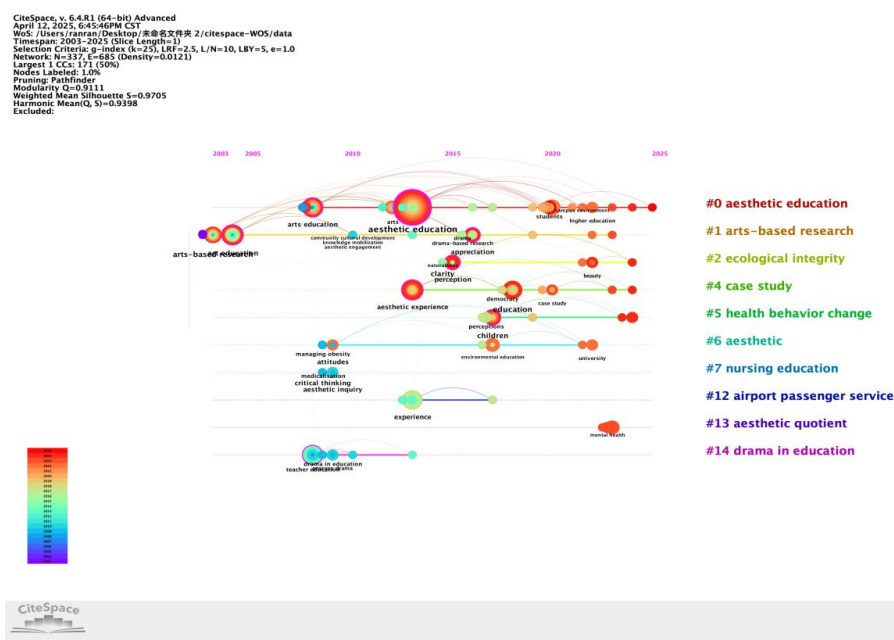


Figure 12. Time Axis of WOS Keywords

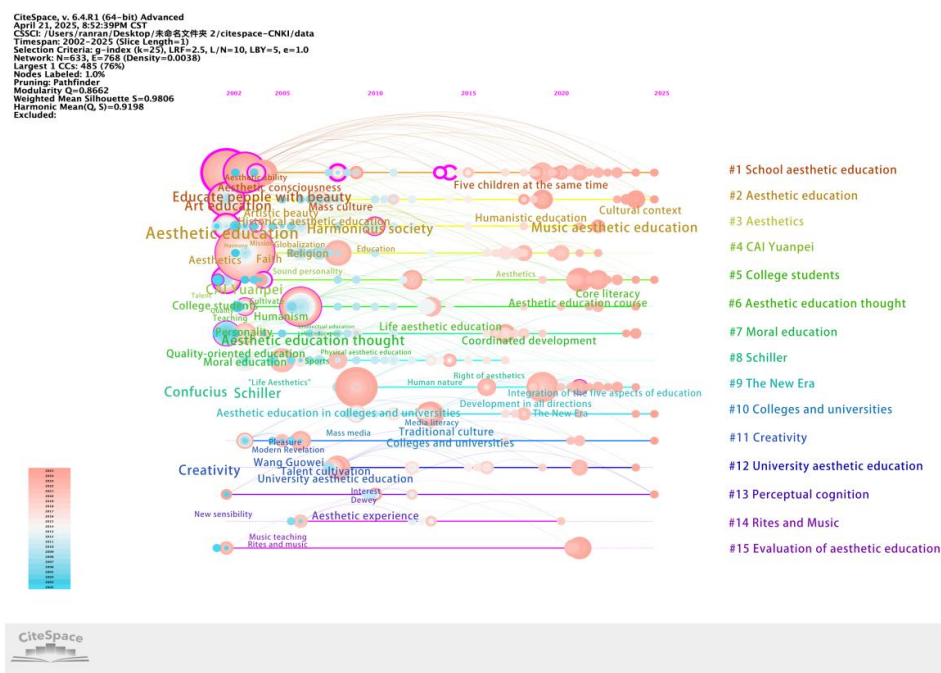


Figure 13. Time Axis of CNKI Keywords

3.4.2 Burst Detection Analysis:

Figures 10 and 11 visualize the frequency, burst strength, and active periods of the top 20 high-frequency keywords from WoS and CNKI between 2002–2023 using CiteSpace. Color blocks intuitively show the concentrated discussion of each keyword in specific years, reflecting the rise and fall of academic popularity. Burst detection not only reconstructs the evolution of aesthetic education knowledge but also reveals the periodic fluctuations of hotspots, providing quantitative basis for identifying academic frontiers and predicting future directions.

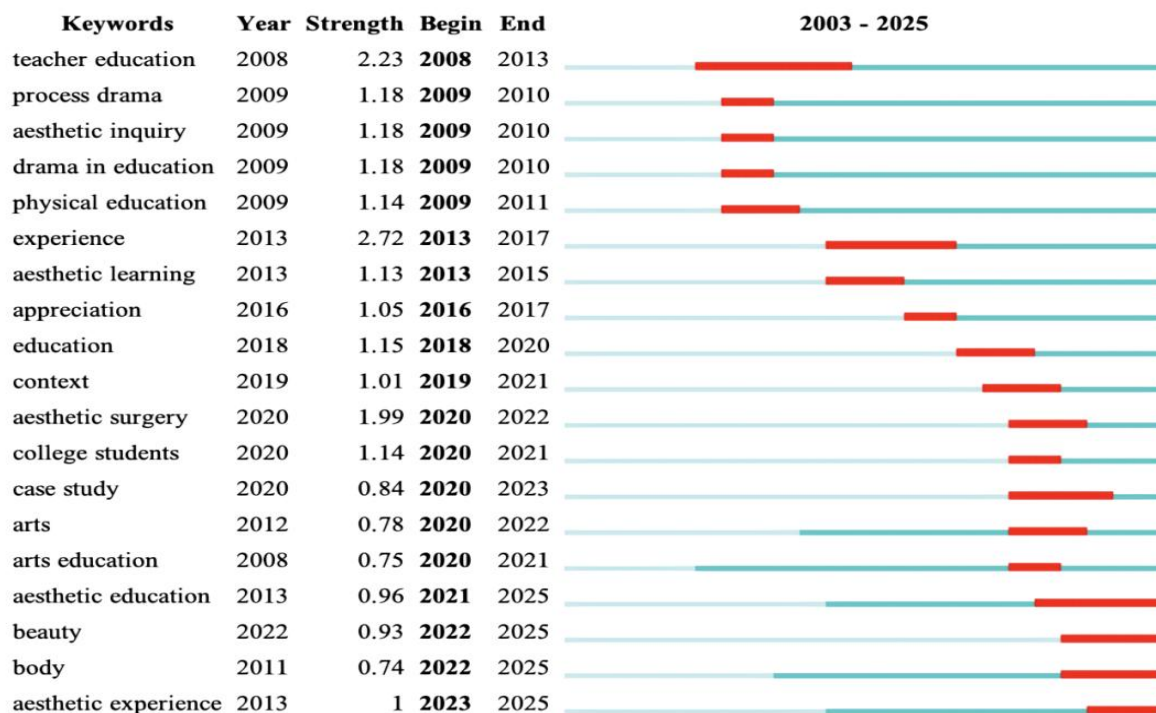


Figure 14. The top 20 keywords with the highest number of citations in WOS



Figure 15. The top 20 keywords with the highest number of citations in CNKI

From 2002 to 2023, aesthetic education research underwent five-stage transitions: ① 2002-2013 "conceptual foundation" – internationally focusing on teacher professionalism and drama practice; in China, it was guided by "quality-oriented education" integrating traditional culture. ② 2013-2018 "practical deepening" – Western studies shifted to experiential learning and aesthetic perception; Chinese universities reinterpreted Cai Yuanpei's thoughts, emphasizing classroom application. ③ 2018-2021 "policy-driven/interdisciplinary" – China systematized school aesthetic education under the "new era" policies; internationally, it integrated aesthetic education with healthcare, technology and other fields. ④ 2020-2023 "crisis response" – the pandemic spurred online aesthetic education and rural promotion, with both China and foreign countries emphasizing humanistic care and aesthetic experience. ⑤ 2021-present "literacy reconstruction" – China incorporated aesthetic literacy into the core literacy framework; international studies continued to deepen the concept of aesthetic education.

Keyword timelines reveal: foreign research paths moved from teaching method innovation to technology and interdisciplinary applications; China advanced from macro concepts to institutional implementation. The two are complementary in policy orientation and technical focus. This context outlines the complete evolution of aesthetic education from theoretical foundation, cross-field integration to responding to social changes, providing clear coordinates and strategic references for future global aesthetic education in digitalization, humanism and comprehensive literacy cultivation.

DISCUSSION

4.1 Advantages of Bibliometric Analysis:

This study uses CiteSpace to quantitatively analyze 909 literatures from Web of Science and CNKI. Its core strengths lie in dynamically capturing the explosive growth of emerging themes in recent years through burst detection, accurately presenting the migration trajectory of research frontiers. Based on correlation analysis of literature data, it empirically verifies the positive correlation between the implementation of aesthetic education policies and increased emphasis on school art education, providing quantitative basis for policy evaluation. Through keyword co-occurrence networks and clustering analysis, it clearly reveals differences between Chinese and Western studies, and identifies technology integration as a global common trend, highlighting the method's analytical power in cross-cultural comparisons. Thus, this bibliometric analysis method, with advantages of temporal tracking, empirical verification and cross-cultural interpretation, constructs an objective and visual knowledge graph for aesthetic education research.

4.2 Contributions to Existing Research:

This study achieves four breakthroughs based on existing literature: it is the first to condense core themes of aesthetic education from four dimensions—theory-practice, policy-responsibility, talent-evaluation, and innovation-integration—constructing a systematic cognitive framework. It verifies through quantitative data the significant role of aesthetic education policies in promoting school educational practices, filling the gap in quantitative research on policy effects. It clearly reveals fundamental differences in Chinese and Western research paradigms, e.g., Western focus on individual experiential learning vs. Chinese emphasis on policy implementation paths, facilitating precise cross-cultural dialogue. It takes the lead in identifying technological empowerment as a common trend transcending cultural differences, providing key signposts for global aesthetic education transformation.

4.3 Future Directions and Prospects for Aesthetic Education Research:

Driven by both the technological revolution and social transformation, aesthetic education is undergoing a paradigmatic shift: Technologies like AI and VR break down temporal and spatial barriers, enabling data-driven personalized teaching and "virtual-real integrated" classrooms, shifting aesthetic education from skill indoctrination to cultivating emotional empathy, cultural discernment, and innovative thinking. Meanwhile, with initiatives such as "Belt and Road" art tours and transnational virtual laboratories, an inter-civilizational aesthetic education community is being built to balance cultural subjectivity with global exchange and resist aesthetic homogenization caused by technological hegemony. Rural and social aesthetic education, cross-barrier media, and all-age programs expand resource coverage, promoting educational equity and enhancing public aesthetic literacy. Furthermore, aesthetic education assumes social responsibility by shaping aesthetic ability, imagination, and critical thinking, repairing individual psychology and elevating civilizational taste. The future requires a trinity of political support, cultural heritage, and technological innovation, establishing multi-dimensional evaluation systems and a team of "practitioners of beauty" teachers to realize comprehensive quality education that values both aesthetic literacy and social responsibility.

4.4 Limitations of the Research:

Despite using bibliometrics to systematically review global aesthetic education trends and following standard procedures, this study has three limitations: first, the single data source, relying only on Web of Science and CNKI, may miss important results in other databases and grey literature, leading to insufficient comprehensiveness in grasping theoretical depth and policy practice; second, the language scope is limited to Chinese and English, ignoring active research in other languages, restricting the global representativeness of conclusions and the depth of cross-cultural comparisons; third, there may be delays in capturing emerging hotspots—due to retrieval strategies and database update cycles, rapidly emerging frontier issues such as technology integration and aesthetic education ethics may not be fully reflected.

CONCLUSION

Based on core literatures from Web of Science and CNKI over nearly 30 years, this study uses CiteSpace bibliometrics to reveal the four-stage evolution of aesthetic education: from conceptual foundation, practical deepening, policy-driven development to crisis expansion. Annual output grows steadily, with hotspots shifting from basic theories and art courses to policy effects, cross-domain integration, then to AI/VR technologies, rural aesthetic education and resource equity. Co-occurrence and burst analysis show current research converges on five cores: ① ontology and value of aesthetic education, ② policy implementation and evaluation, ③ teaching and curriculum innovation, ④ technology-driven paradigm reform, ⑤ resource expansion and social mission. Looking ahead, the most promising research frontiers will include in-depth empowerment of AI/VR, global aesthetic education community, resource equalization mechanisms, integrated evaluation systems, transformation of "beauty practitioners" teachers, and the role of aesthetic education in social resilience and mental health—providing theoretical support and practical paths for global aesthetic education.

Ethical approval

No ethical approval was required as this study did not involve human participants

Consent to publish

The author agrees to publish in this journal

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

The authors declare that they received no financial support for the research and/or publication of this article.

Author Contributions

YL: Conceptualization, data curation, formal analysis, writing (original draft), writing (review and editing), investigation, methodology, project administration, resources, validation, and visualization.

Data Availability Statement

The original contributions presented in this study are included in the article/supplementary materials. If you have any questions, please contact the author.

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