

Art Education Innovation Management Model in the 21st Century for Applied Universities in Zhejiang Province

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ABSTRACT

This study aims to explore the 21st-century art education innovation management model for applied universities in Zhejiang Province, focusing on assessing its current level, identifying core components via exploratory factor analysis (EFA), and proposing a comprehensive framework. A mixed-methods approach was adopted, involving quantitative surveys with 504 administrators and teachers from 36 pilot applied universities, supplemented by qualitative interviews with 10 educational experts. Quantitative data were analyzed using descriptive statistics and EFA, while qualitative data underwent thematic analysis. Results indicate an overall moderate-to-high development level (mean= 3.90), with policy support (mean= 4.02) and technological integration (mean= 3.98) scoring highest, and internationalization (mean=3.82) and innovation achievement sharing (mean=3.76) needing improvement. EFA identified six key factors: policy support, technological integration, interdisciplinary collaboration, cultural identity construction, internationalization, and innovation achievement sharing, collectively explaining 72.62% of variance.

Keywords : Art education, Innovation management model, Applied universities

1. Introduction

In the context of the integration of the intelligent technology economy and the cultural industry, Zhejiang Province's applied universities are undergoing a transformative shift in their

art education innovation management model, moving from mere "tool innovation" to a comprehensive "paradigm reconstruction." This transformation is not only central to the modernization of higher education but also vital for constructing a regional innovation ecosystem. Zhejiang, as a national hub for intelligent technology and cultural heritage, exemplifies how technology can empower educational modernization and creatively transform traditional culture. To address these challenges, future research must focus on constructing a comprehensive theoretical framework that integrates technological, educational, and cultural logics. This framework should emphasize interdisciplinary research, dynamic monitoring, and the development of innovative management practices. It should also consider the unique regional characteristics of Zhejiang, such as its private economy and technological leadership, to ensure the model's sustainability and long-term impact. By filling these research gaps, the study aims to contribute to a more effective and relevant art education innovation management model for applied universities in Zhejiang, enhancing the quality and global impact of art education.

2. Research Objectives

1. Objective 1. To study the level of art education innovation management model in the 21st century for applied universities in Zhejiang province.
2. Objective2. To study the Exploratory Factor Analysis of art education innovation management model in the 21st century for applied universities in Zhejiang province.
3. Objective3. To propose art education innovation management model in the 21st century for applied universities in Zhejiang province.

3. Scope of the Research

1. Population Scope

The research targets administrative staff and teachers from 41 pilot undergraduate institutions in Zhejiang Province focused on application-oriented construction. These institutions are selected for their role in vocational education reform and as national demonstration zones. A sample of 36 universities was chosen, with 14 respondents (7 administrators and 7 teachers) from each, totaling 504 participants. This ensures a comprehensive perspective on art education management, balancing technological advancement and cultural heritage.

2. Variable Scope

The study examines independent variables such as policy support, technological integration, interdisciplinary collaboration, cultural identity construction, internationalization, and innovation achievement sharing. These variables are derived from art education innovation management theory and related frameworks. The dependent variable is the model's effectiveness, measured by teaching quality, student competitiveness, and alignment with regional needs.

3. Time Scope

The research focuses on the 21st century, particularly the period influenced by key policies like the “Action Plan for High-Quality Development of Art Education in the New Era” (2023) and the “14th Five-Year Plan for Education Informatization” (2021–2025). Data from 2018–2023 are analyzed to identify trends, and projects from 2020–2022 are referenced to assess the dynamic evolution of management models. This captures both immediate impacts and long-term trends in art education innovation.

4. Literature Review

The landscape of applied universities has increasingly drawn scholarly attention, driven by their pivotal role in bridging higher education with industry needs, regional development, and global competitiveness. This review synthesizes insights from relevant studies, exploring three interconnected aspects: practice - based learning and transformation, university - industry collaboration, and internationalization and entrepreneurial education.

Practice - based learning is central to the mission of applied universities. Chen, Li, & Zhou (2020) conducted a comparative study, highlighting how this approach sets applied universities apart from traditional academic institutions, emphasizing curricula rooted in real - world applications for workforce preparation. Li & Zhao (2020) further explore the transformation of local universities into applied ones, identifying challenges like aligning faculty expertise with practice - based requirements and revamping assessment systems, noting it as a comprehensive educational philosophy overhaul. Wang (2018) traces the evolution of applied higher education in China via policy framework analysis, providing historical context for the current emphasis on practice - based learning.

University - industry collaboration is vital for applied universities' relevance. Chen & Zhao (2020) present a Chinese case study, finding that effective partnerships enable curriculum co - design, industry - based research, and improved graduate employability. Liu (2020)

conducts a multi - case analysis, revealing that mutual trust, clear benefit - sharing, and long - term commitment are key to successful collaborations. Liu & Huang (2020) focus on bridging the skills gap through such collaboration, showing that joint efforts can identify skill needs and develop targeted programs. Schmidt (2015) offers a European perspective, suggesting applied science universities act as innovation hubs, transferring knowledge to industry and promoting economic growth.

Internationalization and entrepreneurial education drive global competitiveness and innovation in applied universities. Chen & Zhang (2020) explore internationalization challenges like cultural barriers and funding, while Xu (2021) delves into strategies such as exchanges and joint programs as best practices. Sun (2022) argues international initiatives are key for global workforce preparation. On entrepreneurship, Chen (2019) emphasizes integrating entrepreneurial thinking into curricula, and Zhang & Liu (2021) propose a theory - practice integrated model for such education.

Additionally, Liu (2022) highlights the role of applied universities in regional economic development, and Sun & Wang (2022) explore the impact of industry - oriented research on transformation. Wang & Zhao (2020) and Wang, Li, & Chen (2019) respectively examine policy and industry - academia partnership aspects for sustainability. Xu (2020) and Wang & Li (2022) add to the international engagement discourse, showing exchanges and strategies are integral. Xu & Li (2022) focus on optimizing university - enterprise collaboration to adapt to industrial changes.

Overall, the literature depicts dynamic applied universities evolving to meet practice - based learning, collaboration, internationalization, and entrepreneurial education demands. These aspects are interwoven, with effective integration key to success. However, challenges like balancing academic rigor and practice, deepening collaborations, and realizing internationalization/entrepreneurial potential remain. Future research could explore overcoming these and integrating trends like digital transformation.

5. Research Methodology

1. Research Methodology

This study adopts a mixed-methods approach to explore the art education innovation management model in Zhejiang's applied universities. Quantitative data were collected via a structured questionnaire distributed to 504 participants (252 administrators and 252 teachers) from 36 pilot universities. The questionnaire used a 5-point Likert scale to assess dimensions

such as policy support and technological integration. Qualitative insights were gathered through semi-structured interviews with 10 educational experts. This dual approach combines the breadth of quantitative data with the depth of qualitative perspectives.

2. Research Steps

The research process was systematic. It began with a literature review to identify key concepts and gaps. Research instruments, including a questionnaire and interview protocols, were then developed and validated through expert reviews and pilot testing. Data collection involved distributing questionnaires and conducting interviews, ensuring ethical standards. Finally, data were analyzed using statistical and thematic techniques to address the research questions and formulate the proposed model.

3. Data Collection

Data were collected from two sources: quantitative surveys and qualitative interviews. For the surveys, 504 participants (administrators and teachers) from 36 universities were selected. Questionnaires were distributed through institutional channels, with follow-ups to ensure high response rates. For interviews, 10 experts with backgrounds in education and technology were selected. Interviews were conducted online, recorded with permission, and transcribed for analysis. This approach ensured comprehensive data capturing both broad trends and detailed insights.

4. Data Analysis

Quantitative data were analyzed using statistical software to generate descriptive statistics and exploratory factor analysis, identifying key factors and assessing their reliability. Qualitative data underwent thematic analysis to identify recurring themes related to the model's core dimensions. Integrating both analyses provided a comprehensive understanding of the art education innovation management model, informing the proposed recommendations and ensuring the results were both statistically sound and contextually relevant.

6. Research Results

This study investigates the art education innovation management model for applied universities in Zhejiang Province, focusing on three core objectives: assessing the current level of the model, identifying its underlying components through exploratory factor analysis, and proposing a comprehensive framework. Data were collected from 504 respondents (252 administrators and 252 teachers) from 36 pilot applied universities in Zhejiang, with 486 valid

responses (96.4% validity). In-depth interviews with 10 educational experts supplemented the quantitative findings. The results are presented below.

1. Current Level of Art Education Innovation Management

Table 1 measured using a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). Table 1 The results reflect the perceived effectiveness and implementation of each dimension in practice.

Table 1 Scores and standard deviations for key dimensions of the art education innovation management model

Dimension	Mean (M)	Standard Deviation (SD)	Level
Policy Support	4.02	0.81	High
Technological Integration	3.98	0.83	High
Interdisciplinary Collaboration	3.95	0.85	Moderate
Cultural Identity Construction	3.89	0.87	Moderate
Internationalization	3.82	0.89	Moderate
Innovation Achievement Sharing	3.76	0.92	Moderate
Overall	3.90	0.86	Moderate

Table 1 indicates an overall moderate-to-high level of development (M = 3.90) for the art education innovation management model in Zhejiang's applied universities. Policy support (M = 4.02) and technological integration (M = 3.98) scored the highest, reflecting strong government initiatives and widespread adoption of digital tools such as AI, VR/AR, and blockchain in art education. These results align with Zhejiang's strategic positioning as a national digital economy hub and its policies like the "Action Plan for High-Quality Development of Art Education in the New Era."

2. Exploratory Factor Analysis (EFA) of the Model

Exploratory factor analysis was conducted to identify the underlying components of the art education innovation management model. The suitability of the data was confirmed by a Kaiser-Meyer-Olkin (KMO) value of 0.85 and a significant Bartlett's test of sphericity ($\chi^2 = 5,218.32$, $df = 45$, $p < 0.001$), indicating strong inter-variable correlations. Principal Component Analysis (PCA) with Varimax rotation extracted six factors, collectively explaining 72.62% of the total variance (Table 3).

Table 2 confirms the six-factor structure of the model.

Factor	Items	Factor Loadings	Eigenvalue	% of Variance	Cumulative %
1. Policy Support	10	0.685–0.782	32.57	27.14	27.14
2. Technological Integration	10	0.687–0.776	18.92	15.77	42.91
3. Interdisciplinary Collaboration	10	0.685–0.772	12.39	10.32	53.23
4. Cultural Identity Construction	10	0.685–0.781	9.75	8.13	61.36
5. Internationalization	10	0.686–0.778	7.62	6.35	67.71
6. Innovation Achievement Sharing	10	0.687–0.783	5.89	4.91	72.62

Factor 1 (Policy Support) includes items related to government funding, long-term policy stability, and equity promotion, highlighting the foundational role of policy in driving art education reform. Factor 2 (Technological Integration) encompasses AI-assisted teaching, VR/AR applications, and intelligent resource management, reflecting the transformative impact of digital tools. Factor 3 (Interdisciplinary Collaboration) focuses on cross-disciplinary curriculum design and project-based learning, emphasizing the importance of breaking disciplinary silos. Factor 4 (Cultural Identity Construction) centers on preserving traditional art forms while fostering innovation, balancing heritage and modernity. Factor 5 (Internationalization) involves global curriculum collaboration and student exchanges, promoting cross-cultural competence. Factor 6 (Innovation Achievement Sharing) includes open educational resources and blockchain-based sharing, optimizing resource utilization.

3. Proposed Art Education Innovation Management Model

Based on the EFA results and expert insights, the proposed model is visualized in Figure 1, illustrating the interconnections between the six factors.

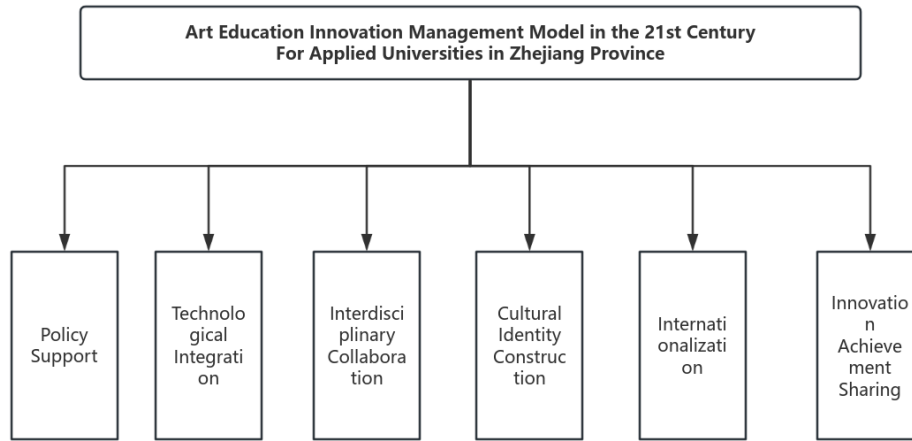


Figure 1: PCA Analysis of the 21st-Century Art Education Innovation Management Model in Applied Universities of Zhejiang Province

Source: Self-drawn by the author

Figure 1 depicts a dynamic ecosystem where Policy Support serves as the foundation, enabling technological integration and resource allocation. Technological Integration and Interdisciplinary Collaboration act as key enablers, enhancing the relevance and effectiveness of art education. Cultural Identity Construction and Internationalization mutually reinforce each other, preserving local heritage while fostering global perspectives. Innovation Achievement Sharing ensures sustainability by optimizing resource use and promoting equity.

The model's practical application is further elaborated in Figure 2, which outlines actionable strategies for each factor.

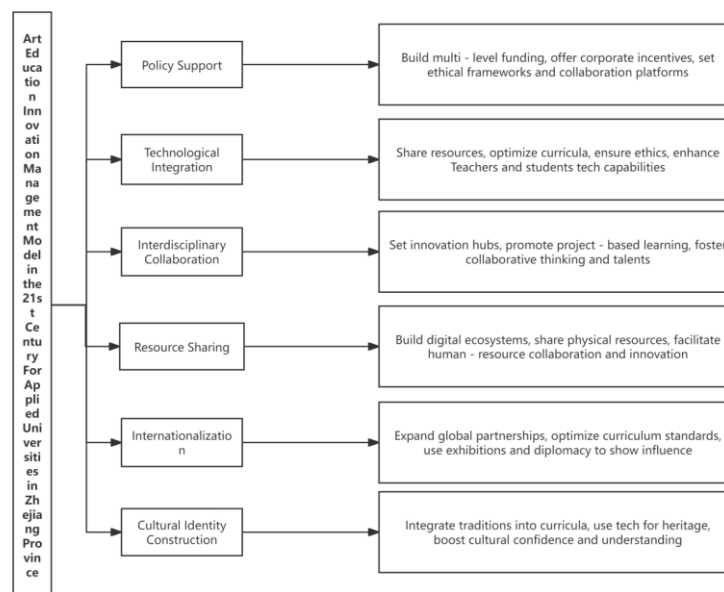


Figure 2: Teaching Innovation Management Model

Source: Self-drawn by the author

Figure 2 emphasizes Policy Synergy between education, culture, and technology departments; Ethical Technological Integration to balance innovation and artistic authenticity; Dynamic Interdisciplinary Ecosystems linking art, industry, and technology; Cultural Heritage Digitization to preserve traditions; Global Partnerships to enhance international relevance; and Open Resource Sharing to maximize accessibility.

7. Discussion

The findings of this study on the art education innovation management model for applied universities in Zhejiang Province align with and extend existing literature on applied higher education, practice - based learning, and university - industry collaboration. The emphasis on policy synergy, technological ethics, interdisciplinary ecosystems, and faculty development reflects a need to address gaps in how applied universities balance academic rigor, practical relevance, and cultural heritage preservation.

The call for a “trinity” policy synergy mechanism (integrating education, culture, and technology departments) resonates with Chen, J., Li, F., & Zhou, H. (2020), who highlight the importance of practice - based learning in applied universities. Their comparative study underscores that fragmented policies hinder the alignment of curricula with regional economic needs, a challenge this study also identifies. By advocating for cross - departmental coordination, the proposed model seeks to create a unified framework that supports both skill development and cultural preservation, echoing the need for holistic policy environments emphasized in their work. The establishment of an art - technology ethics review system responds to concerns about technological overreach in education, a theme indirectly addressed by Schmidt (2015). While Schmidt focuses on the impact of applied science universities on industry from a European perspective, this study extends the discussion to ethical considerations in art education. The risk of algorithmic bias or cultural misrepresentation in AI - driven art practices mirrors broader debates about technology’s role in shaping professional fields, and the proposed ethics board aims to mitigate these risks—an innovation not fully explored in prior research on applied university models.

Building a dynamic interdisciplinary innovation ecosystem aligns with Liu, Y., & Huang, Z. (2020), who stress the role of university - industry collaboration in bridging skill gaps. Their multi - case analysis of applied universities highlights the need for curriculum reform and industry partnerships to enhance graduate employability. This study expands on their work by advocating for modular, project - based curricula and dedicated research platforms, such as

“Art and Technology Innovation Centers,” to foster deeper integration of art, technology, and industry—addressing the practical challenge of siloed departments in applied universities. Strengthening faculty development programs reflects the findings of Chen, R., & Zhang, Y. (2021), who emphasize innovative teaching strategies in applied universities. Their case studies from China show that educator readiness is critical for implementing reform, a point echoed here. By proposing targeted training in digital tools and pedagogical innovation, the study addresses a gap in faculty support, ensuring educators can effectively deliver interdisciplinary, technology - integrated curricula—a need underscored by the rapid evolution of art - tech fields.

8. Recommendations

First, it is essential to construct a “trinity” policy synergy mechanism integrating education, culture, and technology departments. Currently, policies related to art education innovation are often fragmented across different administrative bodies, leading to inconsistent implementation and underutilization of resources. By establishing a cross-departmental “Art Education Innovation Policy Coordination Committee” comprising representatives from Zhejiang’s Provincial Department of Education, Department of Culture and Tourism, and Department of Science and Technology, the province can develop a unified policy framework that aligns art education goals with regional economic development, technological innovation, and cultural heritage preservation. This committee should oversee the integration of key initiatives, such as the “Action Plan for High-Quality Development of Art Education in the New Era,” the “14th Five-Year Plan for Education Informatization,” and the “Regulations on Promoting the Digital Economy,” ensuring that funding, resource allocation, and reform priorities are mutually reinforcing. For example, special funds for emerging art disciplines—such as digital media art and virtual heritage preservation—should be tied to performance metrics like industry-university collaboration projects and graduate employment rates in art-tech fields, ensuring accountability and effectiveness.

Second, an art-technology ethics review system must be established to guide the healthy development of technological integration. As intelligent technologies such as AI, VR/AR, and blockchain become increasingly prevalent in art education, there is a risk of prioritizing technical tools over educational goals, leading to issues like algorithmic bias in creative evaluations or the erosion of traditional artistic practices. To mitigate these risks, each applied university should form an interdisciplinary “Art-Technology Ethics Review Board”

including art educators, technology experts, ethicists, legal professionals, and cultural heritage representatives. This board will develop clear ethical guidelines for technology use, covering areas such as transparency in AI-generated art, authenticity in digital heritage reconstruction, protection of student data, and prevention of cultural misrepresentation. For instance, guidelines should require that AI models used in art courses are trained on diverse, inclusive datasets to avoid privileging specific artistic styles, and that students are explicitly taught to distinguish between human creativity and algorithmic assistance.

Third, building a dynamic interdisciplinary innovation ecosystem is critical to promoting deep integration of art, technology, and industry. Applied universities in Zhejiang often face barriers to cross-disciplinary collaboration, such as rigid departmental structures and siloed resource allocation, limiting the relevance of art education to real-world needs. To address this, institutions should reform their curriculum systems to create modular interdisciplinary course frameworks, such as “Digital Media Art,” “Intelligent Design,” and “Cultural Heritage and Digital Economy,” which combine art, science, engineering, and business coursework. These modules should include project-based learning components, where students from different majors collaborate on real-world projects—such as designing urban public art installations or digitizing local cultural relics—commissioned by enterprises or cultural institutions. Universities should also invest in interdisciplinary research platforms, such as “Art and Technology Innovation Centers” and “Cultural Heritage Digital Labs,” equipped with advanced tools like motion capture systems and 3D printers, to support collaborative creation and research.

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