

Development and Research on the Art Element Database Teaching Model in Higher Art Education

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Received February 26, 2026; **Revised** March 28, 2026; **Accepted** April 21, 2026

Abstract

Against the backdrop of the strategy of cultural confidence, the contemporary influence of traditional art and culture has been on the rise, forging a strong sense of cultural identity and consciousness of inheritance among young people in particular. Integrating it into modern art education has thus become a core research topic in the field of higher art education in China.

Focusing on the improvement of higher art education quality and the pain points in art talent cultivation, this paper proposes an innovative integration path of “Traditional Art Element Database + ADDIE Teaching Method”, and constructs a student-centered (SC) Art Element Database Teaching Model with practical value, aiming to accurately empower students’ creative generation and creative skill enhancement.

The research adopts the Delphi method to establish the framework of the teaching model, collects empirical data through multiple methods such as questionnaire surveys (targeting students majoring in higher art) and in-depth expert interviews (covering art education scholars and industry creators), and completes data verification and model effectiveness validation by means of SPSS statistical analysis and ANOVA (Analysis of Variance).

The research results show that this teaching model not only exerts a significant positive impact on fostering the cultural literacy and innovative ability of students majoring in higher art, but also infuses cultural genes into China’s higher art education, promoting its transformation towards openness, innovation, and diversity. This study provides an operable practical paradigm for the educational inheritance of traditional art, as well as data support and theoretical reference for the teaching reform of higher art education.

Keywords: Art Element Library Teaching Mode; ADDIE Instructional Method; Student-Centered (SC); Traditional Chinese Artistic Culture

Introduction

As a part of the strategic perspective of cultural confidence, a transmission of traditional Chinese culture and the development of artistic abilities containing both cultural heritage and innovative potential is the focus of higher art education. Wang, Huang and Zhang (2025) identifies that contemporary art education must be of the contamination of traditional art and, on the contrary, Huang, Zhang and Li (2025) writes that cultural genes need to be activated and the perpetuation of the excellent culture must be encouraged. These perceptions underscore the fundamental role and importance of higher art education in the cultural transmission.

The main problem is that learners are willing to use traditional culture in their works, yet the existing teaching philosophy is not systematic and practical enough to provide students with systematic and practice-based instruction on the topic, thus they have the knowledge of beauty and cannot translate it into the practical world. This impairs the progress of creativity and the heritage of traditional art, and thus the kind of education reform is urgent. The proposed research solution is to build a student-oriented Art Element Database Teaching Model through the ADDIE framework to resolve the creative dilemma, bridging the gaps in the art element library integration, facilitating education reformation, and facilitating transformation and innovative development of traditional Chinese culture.

The paper finds the possible application of ADDIE framework and student-centered (SC) approach by constructing the closed-loop Art Element Database Teaching Model which includes five processes (see Figure 1) and explains the main activities of each of them. The paper gives information about the objectives, paths, and value of the model, offers the practice of teaching design schemes, transforms the database of art elements, which is a manual library, into a dynamism creation support system, and gives advice regarding cultural inheritance and innovative development in higher art education.

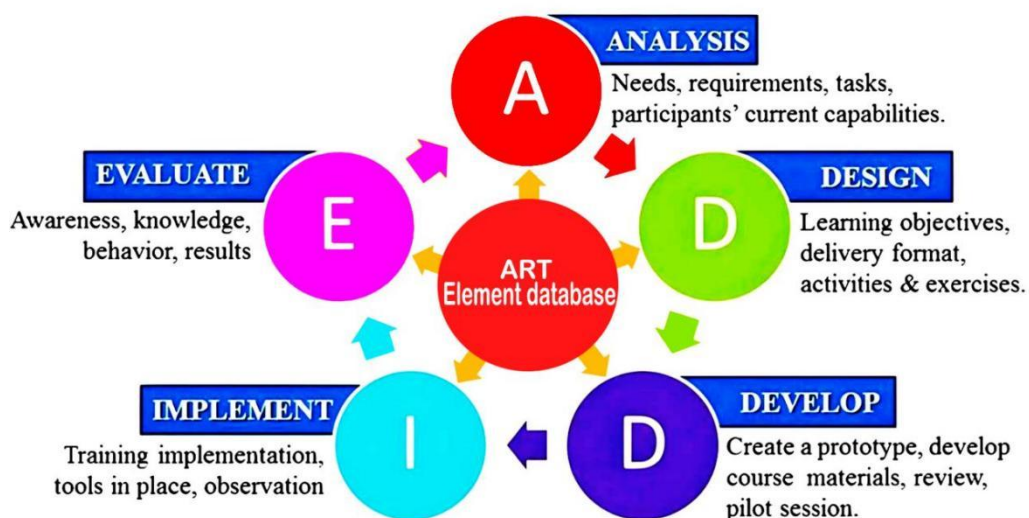


Figure 1 Teaching model of Art Element library (Source: Constructed by researchers)

Research Objectives

1. Analyze the directions that need optimization in the structure of higher art education in China.
2. Develop a teaching model that integrates the art element database with student-centered learning.
3. Examine the effectiveness of the proposed teaching model in enhancing students' innovative capabilities.

Literature Review

1. Development Context and Contemporary Challenges of Higher Art Education in China

The development of higher art education in China is based on the influences of the late Qing Dynasty and the Republic of China acculturation, the aftermath of the Soviet socialistic realism mode, the subsequent diversification of development following the establishment of the People's Republic, and the diversified internationalization of the education after the era of reform and opening-up (Yang & Suchan, 2009). In the 21st century, due to the emergence of cultural confidence and Guochao (Chinese trend), the passing and the innovation of the traditional Chinese culture is now a strategic social priority. According to existing literature, there are structural contradictions to this demand: the design of the curriculum and teaching formats are highly influenced by Western frames, at the expense of traditional art and culture; at the same time,

despite a high level of awareness and interest towards traditional culture, in practice more than 9 out of ten students want to incorporate elements of Guochao into design most of the time, which creates the phenomenon of knowing but not implementing, because there are even no systematic major or courses on intangible cultural heritage (ICH) (Jia & Laoakka, 2025; Zheng, 2024). Closing the divide between the cultural curiosity and creative capacity of students is therefore an immediate undertaking in the present art education remodelling.

2. Shift in Teaching Paradigm: Theory and Practice of “Student-Centered (SC)” Approach

In order to enhance effectiveness and student innovation in teaching, the paradigm has transformed into student development-centered, student learning-centered, learning outcome-centered over three old centers (teacher-centered, textbook-centered, classroom-centered) as part of global higher education reform (Woods & Copur-Gencturk, 2024). Student-centered (SC) approach is where the students are placed in charge; it is important that the instructional design is based on the students building meaning and learning skills, instead of only transmission of knowledge. The philosophy of this study will be based on the following consideration: successful instruction in traditional culture must have practical avenues and supports to the traditional items of the students to study, manipulate, reconstruct, and utilize, instead of a unidirectional block of knowledge.

3. Art Element Library: Conceptual Evolution and Educational Application Potential

The idea of Art Element Library has been developed with the development of digital technology and protecting cultural heritage. At first, it denoted an online collection and organizing center of visual materials (e.g., graphics, patterns, colors) in traditional art (Yu, 2023). As technology has developed, its definition has come to be an ever-changing interactive environment that meets intelligent search, creative support, and cultural fusion (Lin et al., 2024). Element libraries have been demonstrated in studies of art education to be able to offer students organized traditional aesthetics material, and aid students in the efficient acquisition of material and creative recombination, which broadens creative horizons and intellectual insight into culture (Hou et al., 2023). Nevertheless, the majority of studies are conducted on technical construction or on case implementation, which is not integrated into a student-centered curriculum and replicable, assessable teaching model, which is one of the critical research gaps.

Research Methodology

This paper uses the mixed method in the form of an exploratory study that uses both quantitative and qualitative data to develop the Art Element Database Teaching Model in three phases and confirm its success in raising the level of creativity and innovative transformation of traditional culture in art students.

Stage 1: The questionnaire survey was done with undergraduates in art colleges in various regions (qualified reliability and validity in 400 samples). Data analysis using SPSS software helped reveal the main issues and shortcomings in the traditional cultural inheritance, which served to build a model.

Stage 2: Delphi procedure was used where 5 experts and front-line teachers were involved to first construct a teaching model combining SC concept and ADDIE model. The operable model came out to be mature and operative after observation during practice with 50 students and also through an act of iteration as per expert view.

Phase 3: 200 students of art were chosen, SPSS T-test was used to compare the pre-test and post-test data. The effectiveness of the model application has been shown in combination with the assessment of 5 professionals, which gives both quantitative and authoritative arguments to its optimization and promotion.

Research Results

1. Clarifying the Optimization Directions of the Structure of China's Higher Art Education

For Research Objective 1, this study identified the core optimization directions through pre-questionnaire tests and multi-college comparative analysis, providing a targeted basis for the subsequent development of the teaching model.

Specifically, this study compiled the "Art Element Database Teaching Model Questionnaire" with 50 items, verified its reliability to provide scientific data support (see Table 1); meanwhile, one-way analysis of variance was conducted on the pre-test data of 400 students from 4 academies of fine arts (see Table 2).

Table 1 Pre-test Quality Metrics of the Art Element Database Teaching Model

SN	Indicator	Numerical value
1	Number of projects	50.0
2	Sample size	400.0
3	Cronbach α based on standardized projects	0.847
4	Average project difficulty	0.434

Table 1 shows that the Art Element Database Teaching Model Questionnaire compiled in this study has reliable psychometric quality overall. The questionnaire is well dimensional covering 50 items and a pre-test sample of 400 is sufficient in sample requirements of the scale reliability and structural testing. The alpha coefficient observed between the items that are standardized is 0.847, which attains a good level ($\alpha > 0.80$) implying that internal consistency of the scale is high. The mean difficulty of the questionnaire is 0.434, which is within the perfect measurement (0.3–0.7). With a moderate difficulty level, the questionnaire not only ensures good discriminant validity but also avoids response frustration among participants, laying a solid foundation for the subsequent effectiveness testing of the teaching model.

Table 2 One-Way ANOVA of Dimension Scores Among 400 Students from Different Art Colleges

Dimension	Statistics (%)	China Academy of Art	Xi'an Academy of Fine Arts	Guangzhou Academy of Fine Arts	Tianjin Academy of Fine Arts	F	p
Analytical ability	Minimum	2.5	7.5	10.0	5.0	0.413	0.743
	Maximum	87.5	87.5	77.5	80.0		
	Average value	44.25	42.05	43.5	42.25		
Design ability	Minimum	7.5	2.5	2.5	10.0	0.264	0.851
	Maximum	80.0	90.0	80.0	90.0		
	Average value	42.85	42.67	44.65	42.98		
Development capability	Minimum	7.5	12.5	5.0	10.0	0.68	0.564
	Maximum	90.0	87.5	85.0	80.0		
	Average value	40.75	43.08	42.5	44.15		
Implementation ability	Minimum	10.0	7.5	5.0	5.0	1.001	0.392
	Maximum	80.0	77.5	87.5	90.0		
	Average value	45.25	41.33	44.38	42.5		
Evaluation ability	Minimum	2.5	5.0	10.0	10.0	1.708	0.165
	Maximum	90.0	82.5	87.5	82.5		
	Average value	43.05	42.2	46.55	46.75		
Comprehensive ability	Minimum	14.5	16.5	25.5	18.0	0.671	0.57
	Maximum	74.5	72.5	70.5	71.0		
	Average value	43.23	42.27	44.31	43.73		

The one-way ANOVA results in Table 2 reveal that students from four academies—the China Academy of Art, Xi'an Academy of Fine Arts, Guangzhou Academy of Fine Arts and Tianjin Academy of Fine Arts—demonstrated deficiencies in design, development, implementation and evaluation capabilities in traditional art creation.

There were no significant differences in all dimensions among the four academies (with low F values and $p > 0.05$), only minor numerical fluctuations were observed. Overall, the pre-test baseline level of the four academies was moderate, which provided a robust foundation for the subsequent testing of the teaching model's effectiveness and cross-academy comparative analysis.

Combining the research data and investigations into teaching practice, three core optimization directions for the structure of China's higher art education were identified. First, in terms of teaching content, it is necessary to break the limitation of the material accumulation of traditional artistic elements, establish a systematic and structured artistic element resource system, connect cultural semantics with creative practice, and resolve students' dilemma of appreciating the beauty of traditional culture yet failing to apply it in practice. Second, in terms of teaching models, it is essential to strengthen the student-centered teaching orientation, integrate digital teaching resources with systematic teaching processes, and make up for the deficiencies of existing models in practicality and transformation paths. Third, in terms of capability cultivation, it is required to balance the development of students' comprehensive capabilities in analysis, design, development, implementation and evaluation, with a particular focus on fostering their capabilities in curriculum resource development and creative realization, so as to address the issue of lagging progress in the development of certain capabilities.

2. Development and Completion of a Teaching Model Integrating the Art Element Database with Student-Centeredness

For Research Objective 2, this study, relying on the Delphi method and combined with pre-test data feedback, constructed and improved the integrated Art Element Database Teaching Model of "traditional art element database + ADDIE teaching method", realizing the in-depth integration of the two.

2.1 Initial Construction of the Teaching Model

Centering on the research theme of "the teaching model for cultivating the creative ability of students in higher art colleges and universities", taking the interview content of five experts—Shi Gang (Z1), Vitomira Loncar (Z2), Zhang Yongchun (Z3), Yan Jinying (Z4), and Liu Zhonglin

(Z5)—as the core, this study sorted out the interview texts sentence by sentence, extracted representative and relevant core initial concepts, clarified the expert source of each concept, and ensured the objectivity, accuracy and comprehensiveness of coding. The specific initial coding results are shown in Table 3.

Table 3 Concept Labels of the Preliminary Model

Coding Dimensions	Core initial concept	Source of expert coding
Core Components of the Teaching Model	Student-centered (SC)	Z1; Z2; Z3; Z4; Z5
	The ADDIE teaching model	Z1; Z2; Z3; Z4; Z5
	Art Element Database	Z1; Z2; Z3; Z4; Z5
	Integrated Teaching Model	Z1; Z3
	Five Core Competencies: Analysis, Design, Development, Implementation, and Evaluation	Z1; Z2; Z3; Z4; Z5
	Closed-Loop Teaching Model	Z4; Z5
	Practical Teaching Model	

Axial coding revealed 23 core concepts based on the core initial concepts removed in the initial coding. The concepts were sorted and combined through internal logical links, attribute relationships and research theme after eliminating repetitive and redundant objects and the 4 major categories and 12 subcategories were created, creating a well-structured system of categories.

Using the results of the codings and the opinions of experts, and identifying the weaknesses of the creative skills of the students, accordingly, the Art Element Database Teaching Model was initially built by several stages of discussion and organized evolution. This model is a complex fusion between the Traditional Art Element Database and the ADDIE teaching method.

The model is based on the systematic instructional design theory and combines the student-centered (SC) teaching philosophy, the ADDIE instructional model, and Bloom Taxonomies of Educational Objectives, which create a teaching model cycle.

2.2 Preliminary Investigation and Evaluation of the Teaching Model

In order to check the effect of the teaching model developed during the preliminary stages of the work and enable empirical evidence on optimization process, 50 art undergraduate students of Xi'an Academy of Fine Art were considered as pilots.

The Teaching Model at Art Element Database applied in the actual teaching situations. Based on the preliminary teaching data collection and analysis, the effectiveness of the model was observed and evaluated in a systematic manner and the observable deficiencies were observed, consequently giving focused evidence towards future optimization (see Table 4).

Table 4 Descriptive Statistics of Pre-Test and Post-Test Dimensions for 50 Art University Students (100-Point Scale)

Dimension	Test	Minimum value (%)	Maximum value (%)	Average value (%)	Standard deviation (%)	t	p
Analytical ability	Pre-test	2.5	87.5	43.01	16.22	-4.528	<0.001
	Prognostic test	12.5	85.0	55.05	17.9	-4.528	<0.001
Design ability	Pre-test	2.5	90.0	43.29	17.78	-4.751	<0.001
	Prognostic test	15.0	85.0	55.7	17.37	-4.751	<0.001
Development capability	Pre-test	5.0	90.0	42.62	17.21	-0.428	0.67
	Prognostic test	12.5	82.5	43.75	17.69	-0.428	0.67
Implementati on ability	Pre-test	5.0	90.0	43.36	17.77	-3.963	<0.001
	Prognostic test	17.5	95.0	53.25	16.48	-3.963	<0.001
Evaluation ability	Pre-test	2.5	90.0	44.64	18.03	-5.131	<0.001
	Prognostic test	20.0	92.5	59.35	19.24	-5.131	<0.001
Comprehensi ve ability	Pre-test	14.5	74.5	43.38	10.58	-6.118	<0.001
	Prognostic test	28.5	79.5	53.42	10.98	-6.118	<0.001

As demonstrated in the pre-test and post-test results of 50 students in Xi'an Academy of fine arts (Table 4), analysis ability, design ability, implementation ability, evaluation ability, and comprehensive ability improved significantly among the students, except the development ability. Mean scores increased from 42%–45% to 53%–59%, with all t-values greater than 3.9 and $p < 0.001$. Both the minimum and maximum scores increased simultaneously, indicating that the model exerted a significant facilitative effect on most abilities.

By contrast, development ability rose only slightly from 42.62% to 43.75% ($t = -0.428$, $p = 0.670$), showing no significant difference. This may be attributed to the short task cycle and insufficient practice sessions.

These results provide preliminary evidence for the effectiveness of the model. Based on these findings, the study will optimize the teaching modules related to development ability before conducting a formal post-test with a larger sample.

2.3 Improvement and Maturation of the Teaching Model

Based on the preliminary investigation and evaluation of the teaching model as well as relevant data feedback, the expert team focused on the core issue of insignificant improvement in students' development ability during model application, conducted intensive discussions and argumentation, and finally formed a targeted optimization solution. To effectively improve the cultivation effect of students' development ability, the solution clearly added two major teaching implementation approaches: first, provide standardized samples of the traditional art element database to offer practical references for students, and clarify the core specifications and operational key points of database development; second, strengthen targeted practical guidance to systematically guide students to master the development process, methods and skills of the art element database, with a focus on improving their practical development ability. The research team supplemented and optimized the initially constructed teaching model in accordance with the above expert solutions. After multiple rounds of iteration and refinement, the new teaching model has gradually matured.

In addition, based on the interview content, keyword integration and frequency data analysis of the five specialized experts, the teaching model constructed in this study—which integrates the student-centered (SC) teaching approach, the ADDIE teaching model, and the traditional Art Element Database Teaching Model—has been unanimously recognized by all experts. Experts generally agree that this model can effectively break through the current ability bottleneck in the creation of art college students and practically improve their artistic creation ability.

3. Verification of the Effectiveness of the Proposed Teaching Model in Improving Students' Innovative Ability

3.1 Investigation of Teaching Outcome Data

Table 5 Descriptive Statistics of Pre-Test and Post-Test Dimensions for 200 Art Students Nationwide (100-Point Scale)

Dimension	Test	Minimum value (%)	Maximum value (%)	Average value (%)	Standard deviation (%)	t	p
Analytical ability	Pre-test	2.5	87.5	43.01	16.22	-13.482	<0.001
	Post-test	17.5	95.0	61.2	15.25	-13.482	<0.001
Design ability	Pre-test	2.5	90.0	43.29	17.78	-11.231	<0.001
	Post-test	17.5	100.0	60.25	17.27	-11.231	<0.001
Development capability	Pre-test	5.0	90.0	42.62	17.21	-12.523	<0.001
	Post-test	22.5	100.0	60.84	16.59	-12.523	<0.001
Implementation ability	Pre-test	5.0	90.0	43.36	17.77	-10.968	<0.001
	Post-test	7.5	97.5	59.18	16.06	-10.968	<0.001
Evaluation ability	Pre-test	2.5	90.0	44.64	18.03	-11.939	<0.001
	Post-test	15.0	97.5	62.64	17.09	-11.939	<0.001
Comprehensive ability	Pre-test	14.5	74.5	43.38	10.58	-19.917	<0.001
	Post-test	33.0	83.5	60.82	9.86	-19.917	<0.001

Formal pre-test and post-test conducted on 200 students from four art academies demonstrated that the Art Element Database Teaching Model yielded highly significant improvements across all six competency dimensions. The average pre-test scores of each dimension ranged from approximately 42% to 45%, and increased to 59%–62% in the post-test. The overall competency score rose from 43.38% to 60.82%, representing an overall improvement of about 17.44 percentage points. The t-test showed that t-values for all dimensions were greater than 10 with $p < 0.001$, indicating highly significant differences. Meanwhile, both the minimum and maximum scores increased noticeably, showing a dual effect of “raising the floor and broadening the peak”. Compared with the preliminary pre-test and post-test, implementation ability also improved substantially (43.36% → 59.18%, $t = -10.968$, $p < 0.001$), confirming that the earlier teaching optimization achieved significant effects.

Overall, based on the formal measurement results of 200 students from four institutions, the Art Element Database Teaching Model not only significantly improved students' technical abilities such as analysis, design, development and evaluation, but also exerted a strong positive impact on teaching implementation and comprehensive literacy. These findings provide solid empirical support for its wider application and promotion.

3.2 Expert Evaluation and Review

Based on data evaluation and analysis, and combining the results of the two empirical tests, experts reached a unanimous consensus that the proposed Art Element Database Teaching Model can effectively alleviate students' creative dilemmas and significantly improve their innovation-related competencies (including core abilities such as analysis, design, and development). Meanwhile, the model helps enhance the performance of lower-scoring students and promotes the further development of high-level students.

Table 6 The Art Element Database Teaching Model Effectively Improves the Comprehensive Creative Ability of Art University Students

Capability Dimension Evaluation	Z1	Z2	Z3	Z4	Z5
Analysis Ability	√	√	√	√	√
Design Ability	√	√	√	√	√
Development Ability	√	√	√	√	√
Implementation Ability	√	√	√	√	√
Evaluation Ability	√	√	√	√	√

Verified through evaluation and discussion, the teaching model is effective and feasible in improving students' innovative abilities. With "student-centered" as its core philosophy, the model builds a teaching framework based on the systematic process of the ADDIE model, takes the art element database as material support, and systematically cultivates students' five core abilities through diverse approaches, which is in line with the laws of higher art education and the learning needs of contemporary art college students. This further confirms that the integrated model of "ADDIE teaching model + art element database" is a feasible path to improve the creative abilities of students in art majors, and can provide solid practical and theoretical support for the teaching reform of higher art education.

Discussions

This study focuses on the integration of traditional art resources and higher art education, and its core achievement is the construction of the Art Element Database Teaching Model, which realizes the instructional transformation and reconstruction of excellent traditional Chinese cultural resources (including intangible cultural heritage). This is highly consistent with the research of Xia et al. (2024). They propose that the key to traditional art education is to realize the transformation from "cultural relics" to "teaching" and promote the living inheritance of culture

through systematic resource integration. By decomposing scattered traditional art elements and building a teachable resource system, this study solves the long-standing pain point of “difficulty in implementing traditional resources” and further verifies the rationality of his concept of “instructional transformation of traditional resources”, forming a research consensus.

However, forming a research divergence. Staikidis (2025) advocates that traditional art teaching should give priority to building an independent local aesthetic system and cautiously use Western teaching frameworks to avoid the marginalization of local culture. In contrast, this study adopts an integrated model of “Western framework + local resources”, taking the ADDIE framework as the carrier to build a teaching closed loop. Its core is to rely on the systematicness of Western teaching processes to solve the practical problem of transforming traditional resources into students’ innovative abilities. The difference between the two stems from different research focuses, not denying the core of local aesthetics.

Combined with the empirical results of the whole paper, the model can significantly improve students’ five core abilities such as analysis and design, with an average improvement of about 17 percentage points in each dimension ($p < 0.001$), especially solving the key problem of lagging improvement in development ability. The “cultural understanding – innovative practice” closed loop formed by the ADDIE framework not only conforms to the teaching logic of “observation, copying and creation” proposed by Xia et al. (2024) but also makes up for the shortcoming of traditional teaching of “emphasizing experience but neglecting processes”, which is the core innovation of this study. This achievement not only responds to the dual mission of “cultural inheritance + innovative ability” of higher art education, promotes the transformation of teachers’ roles and curriculum systems, but also enriches the research on the integration of traditional art and modern teaching, provides practical support for the reform of higher art education, and objectively presents research divergences to provide reference for subsequent related research.

New Knowledge from Research

The novel contribution of this study lies in the first construction of the Art Element Database Teaching Model integrating the ADDIE framework and the SC concept. Centered on the student-centered philosophy and supported by the Art Element Database, the model relies on the systematic ADDIE process to systematically cultivate students’ five core competencies: analysis, design, development, implementation, and evaluation. It breaks the dilemma of “recognizing

beauty but failing to apply it” in traditional art education, verifies the effectiveness of the integrated mode of “Western teaching framework + local art resources”, and provides a replicable practical path and theoretical reference for the creative transformation of traditional culture in higher art education (Figure 2).

• **Art Element Database Teaching Model Integrating the ADDIE Framework and the SC Concept**

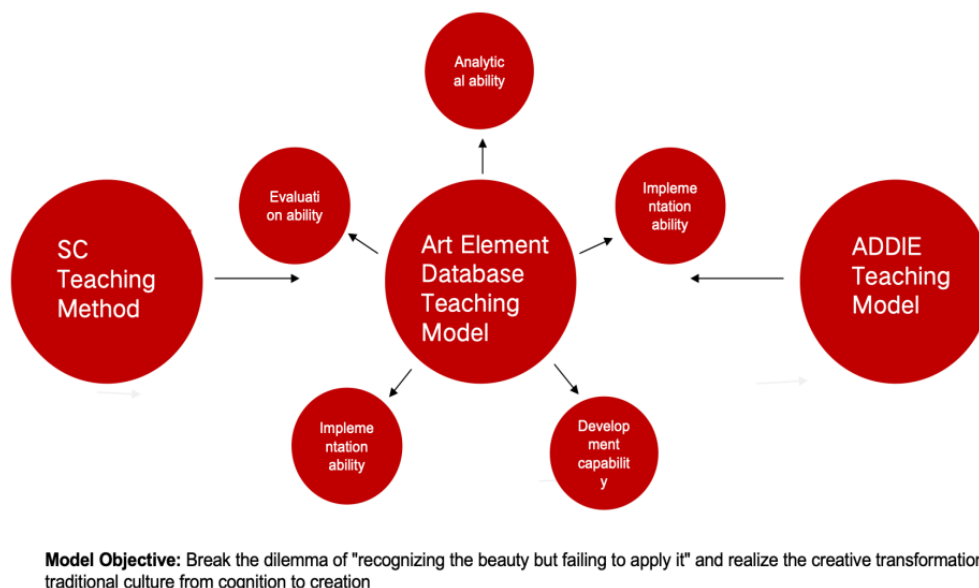


Figure 2 Novel Knowledge Concept Map (Source: Constructed by researchers)

Conclusion

This study accurately identifies the core direction that needs optimization in higher art education — namely, the disconnection between traditional culture and creative practice. The integrated teaching model of “Art Element Database + ADDIE” developed accordingly constructs a complete path from cultural cognition to creative implementation, which is consistent with the student-centered (SC) teaching philosophy.

Empirical tests have confirmed that this model significantly improves students’ innovative abilities, helps them establish a creative logic of “understanding – transformation – innovation”, enables them to get rid of the dilemma of “knowing beauty but being unable to apply it”, and cultivates cultural confidence rooted in practice.

This achievement not only responds to the dual mission of higher art education of “cultural inheritance + innovative ability”, promotes the transformation of teachers’ role from knowledge.

Suggestions

1. General Suggestions

Based on the research results, to promote the practical application and optimization of the “Art Element Database Teaching Model”, the following general suggestions are put forward: expand the application scope of the model to related art majors such as film and television, media and design, and adjust the practical links to adapt to the characteristics of each major; strengthen supporting support by improving the art element database and carrying out teacher training; establish a regular teaching feedback mechanism to continuously adjust the model to meet the actual teaching needs.

2. Further Research Suggestions

In order to ameliorate the research system and increase the overall applicability of the conclusions, the following additional research questions are offered: increase the research sample of greater scopes in order to decrease deviations; introduce regulatory variables and refine statistical procedures to establish the influence mechanism of the model; establish the objectivity of the research limitations, conduct cross-regional comparative research, and longitudinal follow-up studies, to bring in more extensive empirical evidence to optimize the model.

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