

Integration of 3D Design Courses and Cultural and Creative Design

Jiuchong Wang

Liaoning Communication University, Shenyang, Liaoning, China

Abstract. In the new era of design education, 3D design courses have become an important vehicle for cultivating students' spatial thinking, technical practice, and creative expression abilities. Meanwhile, with the vigorous development of the cultural and creative industry, the demand for interdisciplinary design talents in cultural and creative design has become increasingly prominent. These talents are required to not only possess professional skills but also have cultural understanding, innovative integration, and market application capabilities. Against this backdrop, this paper explores the paths and values of integrating 3D design courses with cultural and creative design, aiming to enhance the teaching effectiveness and interdisciplinary nature of the courses, as well as strengthen students' awareness of cultural innovation and comprehensive design literacy. Using literature research, case analysis, and action research methods, this study systematically sorts out the theoretical foundations and practical models of the integration of 3D design and cultural and creative design. Combined with specific curriculum design and project implementation, it proposes a curriculum integration strategy of "culture-oriented, technology-supported, and project-driven". Practice has shown that this model has effectively stimulated students' enthusiasm for creation, strengthened their ability to modernize the translation of traditional cultural elements, and enhanced the application value and social recognition of design achievements. This research is of positive significance for promoting the reform of design education courses, facilitating cultural inheritance and innovation, and serving the development of regional cultural and creative industries.

Keywords: 3D Design; Cultural and Creative Design; Cultural Innovation Abstract.

1. Introduction

Currently, we are in a new era centered on innovation-driven development, where the in-depth integration of culture and technology has become a crucial engine for social and economic progress. Against this macro background, the cultural and creative industry, as a key component of a country's soft power and economic growth points, has demonstrated unprecedented vitality and potential. In recent years, China's cultural and creative industry has achieved leapfrog development, moving from the initial concept exploration stage to a period of rapid growth characterized by large-scale development, marketization, and IP-oriented development. Its development momentum is particularly evident in two major areas: Firstly, museum cultural and creative products represented by the Palace Museum and the Dunhuang Research Institute. By exploring the resources of collected cultural relics, these institutions have transformed the profound historical and cultural connotations into cultural and creative products that combine artistic value and practicality, successfully attracting young consumer groups and creating remarkable market value and social influence. Secondly, local characteristic cultural and creative products based on regional culture and intangible cultural heritage. Relying on unique folk customs, crafts, local specialties, and other resources, various regions have actively developed iconic cultural and creative commodities and experience projects, effectively promoting the coordinated development of cultural inheritance, brand building, and tourism economy.

The rapid rise of the cultural and creative industry has put forward new and higher requirements for the knowledge structure and competence of design talents. The market is no longer in need of operators who only master a single skill, but rather interdisciplinary design talents with 3D digital modeling capabilities, in-depth cultural understanding, creative transformation abilities, and market application thinking. They need to be proficient in using 3D design software to transform abstract cultural symbols, historical narratives, and aesthetic concepts into concrete, interactive, and mass-producible modern product forms, thereby realizing the unification of cultural value and market value.

This new trend in talent demand has pointed out the direction for the teaching reform of higher design education, especially 3D design courses.

However, when we look at the current teaching situation of 3D design courses in many colleges and universities, there is a significant mismatch and disconnection with the urgent needs of the industry. The traditional 3D design curriculum system mostly focuses on software technology itself, and its core teaching content usually centers on technical aspects such as the operation commands, modeling techniques, material rendering, and animation production of mainstream software (e.g., 3D Max, Maya, Blender, ZBrush). This "technology-first" training model leads to the lack of in-depth exploration of cultural connotations in the curriculum content and the systematic cultivation of the thinking for the implementation of cultural and creative products. Students may be proficient in the technology of creating an exquisite model, but they do not know why to design it, how to draw inspiration from the vast ocean of cultural resources, and even less understand how to effectively connect the design results with market demands, production processes, and consumer psychology. As a result, students' works often have excellent technical expressiveness, but lack cultural narrative, have insufficient innovation, and have vague application scenarios, making it difficult to directly meet the dual standards of the cultural and creative industry for the cultural depth and market adaptability of works.

Therefore, promoting the in-depth integration of 3D design courses and cultural and creative design has become a key path to solve the structural contradiction between design education and industrial needs, and enhance students' comprehensive competitiveness and innovative literacy. This integration is by no means a simple addition of content, but a profound curriculum paradigm reform. It requires educators to re-examine the curriculum positioning, introduce cultural projects into the entire teaching process, and while cultivating students' excellent digital technology expression capabilities, systematically incorporate knowledge modules such as cultural research, creative transformation, user research, brand planning, and product implementation, so as to build a "culture-technology-market" trinity teaching framework. This research is carried out under the dual impetus of this practical urgency and educational necessity, aiming to explore an effective model for the integration of 3D design courses and cultural and creative design, and provide practical theoretical and practical references for the cultivation of design talents in the new era.

2. Domestic and Foreign Research Status

2.1 Foreign Research Status

Colleges and universities in Europe and America have earlier explored the integration of design courses with cultural creativity, forming a mature teaching logic of "culture empowering technology". The Royal College of Art in the UK offers the "Digital Design for Cultural Heritage" course and has established a teaching cooperation with the British Museum. It guides students to take collected cultural relics (such as the Egyptian Rosetta Stone and Chinese blue-and-white porcelain) as objects, and uses Blender 3D modeling and Unreal Engine to transform the patterns and shapes of cultural relics into interactive digital models. The course emphasizes the three-stage logic of "cultural interpretation - technology adaptation - value transformation", requiring students to first master the historical background of cultural relics under the guidance of museum researchers, then select appropriate 3D technologies to realize the visualization of cultural elements, and finally produce digital cultural and creative works (such as cultural relic restoration simulation systems) that combine academic and communication value.

The "Sustainable Cultural and Creative Design" course at the Parsons School of Design in the United States focuses on local Indian culture. Students are required to conduct in-depth research on traditional weaving techniques in tribes, use Rhino 3D software to design weaving pattern cultural and creative products that conform to modern aesthetics, and produce prototypes through 3D printing. The course deeply integrates cultural inheritance, technological innovation, and environmental

protection concepts, and its core teaching logic is "driving technology application with cultural needs", avoiding the separation of technical operations from the cultural context.

2.2 Domestic Research Status

In recent years, domestic colleges and universities have carried out explorations around the reform of 3D design courses, but most of these efforts focus on the innovation of a single teaching method, lacking a systematic integration system. The Academy of Arts & Design, Tsinghua University has introduced the "Intangible Cultural Heritage (ICH) IP 3D Modeling" module into the 3D course of the Visual Communication Design major, guiding students to conduct 3D design with patterns of Su embroidery and cloisonné enamel as prototypes. However, this practice does not involve the implementation process of cultural and creative products nor the link of market connection.

The Central Academy of Fine Arts has attempted project-driven teaching by collaborating with the cultural and creative department of the Palace Museum to launch short-term projects, where students completed the 3D IP design of mythical beasts in the Palace Museum. Nevertheless, this course is only offered as an elective. Current research mostly remains at the superficial integration level of "technology + cultural elements", lacking a complete "3D technology + cultural and creative design" integration framework that covers objectives, content, evaluation, and resources.

At present, Cui Ling from the School of Fine Arts and Design, Hunan Institute of Science and Technology has conducted relevant research on the integration of 3D technology and ICH in her work *The Application of Artificial Intelligence 3D Modeling Technology in the Digital Protection of ICH Production Tools* [1]. However, this research is limited to the digital preservation of ICH cultural relics in the form of 3D models. To sum up, there are relatively few domestic cases related to the integration of 3D technology and ICH, as well as cases that conform to the "industry-university-research-application" model.

2.3 Theoretical Significance

In the current field of design education, "technology teaching" and "cultural cultivation" are mostly in a relatively fragmented research state. On the one hand, research related to 3D design mostly focuses on technical aspects such as software operation skills and digital technology iteration, and rarely deeply explores the internal coupling logic between technology and cultural elements. On the other hand, although research on cultural and creative design focuses on the excavation of cultural connotations and creative transformation, it lacks sufficient theoretical support for how to realize cultural implementation through specific technical courses. This leads to the fragmented nature of research on "technology and culture integration" and the lack of a systematic theoretical framework.

By sorting out the core connections between 3D design and cultural and creative design, this study clarifies the integration logic of "technology as the appearance and culture as the core" between the two, and combines constructivist learning theory, design thinking theory, etc., to build an integrated curriculum integration theoretical system of "objectives - content - methods - evaluation". This system not only fills the theoretical gap in the connection between "technical operation" and "cultural literacy" in design education, but also provides a reference theoretical paradigm for subsequent research on cultural integration of similar courses (such as 2D design, interactive design). It further enriches the theoretical connotation of "technology empowering cultural inheritance" in the field of design education, provides solid academic support for the reform of design courses, and promotes the transformation of design education theory from "single skill-oriented" to "the coordinated development of technology and culture".

2.4 Practical Significance

In the teaching practice of 3D design courses in colleges and universities, most teachers face practical problems such as "how to balance technology teaching and cultural integration" and "how to transform the concept of cultural and creative design into specific teaching links". The existing teaching plans mostly stay at the superficial integration stage of "technology explanation + cultural

case interspersed", lacking directly implementable operation paths. As a result, although students master technologies such as 3D modeling and rendering, they are unable to transform cultural elements into cultural and creative products with market value, which is inconsistent with the demand of the cultural and creative industry for interdisciplinary talents with "solid technology, cultural sensitivity, and outstanding creativity".

By refining the integration strategies of "curriculum objective reconstruction, content optimization, method innovation, and evaluation improvement", this study forms an operable plan including specific class hour allocation, teaching case design, and school-enterprise cooperation model. For example, in terms of curriculum content, it clarifies the specific teaching content and implementation steps of the three major modules: "3D foundation empowered by culture", "3D advancement oriented by cultural and creative design", and "comprehensive cultural and creative project practice". In terms of teaching methods, it provides an operation guide for the combined teaching model of "project-driven + interdisciplinary collaboration + immersive experience".

This plan can directly provide teaching references for teachers of 3D design courses in colleges and universities, helping them break through the teaching dilemma of "technology and culture being separated", and guiding students to improve their cultural interpretation and creative transformation abilities while mastering 3D technology. Finally, through curriculum practice, it cultivates interdisciplinary talents who can not only proficiently use 3D technology to realize design concepts, but also deeply explore cultural connotations and create cultural and creative products with cultural recognition. This effectively connects college design education with the needs of the cultural and creative industry, alleviates the mismatch between the supply of talents in the cultural and creative industry and market demand, and provides talent support for the high-quality development of the cultural and creative industry.

3. Analysis of the Current Situation of the Integration of 3D Design Courses and Cultural and Creative Design

Against the backdrop of continuous innovation in contemporary design education, clearly defining the core concepts of 3D design courses, cultural and creative design, and curriculum integration serves as a crucial prerequisite for advancing the in-depth integration of the two (3D design and cultural and creative design), enhancing teaching quality, and improving students' comprehensive literacy. The following will elaborate on these core concepts in detail by combining practical cases and research findings.

As one of the core courses for design-related majors, 3D design courses take technologies such as 3D modeling, rendering, animation, and 3D printing as their core teaching content. Through systematic learning, students acquire skills in spatial modeling and can use digital means to transform creative ideas in their minds into visual 3D models. For instance, in the course 3D Image Design 1 (3D Modeling) at the School of Art and Design, Wuhan Polytechnic University, Teacher Ni Xueying guides students to conduct in-depth exploration of the field of 3D technology (School of Art and Design, Wuhan Polytechnic University, 2025). The course requires students to master the basic knowledge and operation methods of 3D modeling, guides them to understand the fundamental logic of 3D spatial modeling and its close connection with the real world, thereby helping them establish a unique way of thinking based on 3D space. In the teaching of the difficult point of circular structure modeling, Teacher Ni ingeniously introduces Liu Hui's Cyclotomic Method, creating a fascinating integration of ancient mathematical classics with modern 3D technology. This helps students intuitively understand the concept of approximating a circle through regular polygons, laying a solid foundation for students to model complex shapes in subsequent studies. This fully reflects the core objective of 3D design courses, which is to cultivate students' abilities in spatial modeling and digital expression.

Cultural and creative design focuses on creative transformation and design empowerment with cultural elements as the core. The cultural elements here cover a wealth of content, including

traditional patterns, historical stories, and local folk customs. Its ultimate goal is to create products that possess both profound cultural value and good market value. Taking the cultural and creative products of the Palace Museum as an example, the design team conducts in-depth exploration of the rich cultural resources contained in the Palace Museum. They abstract the images of characters in the Palace Museum, select the images of cultural relics in the museum, patterns of representative cultural relics or buildings as design elements, and carry out re-combination and innovative design. Through a series of creative transformations, a diverse range of cultural and creative product series of the Palace Museum have been successfully launched. These products not only inherit and promote traditional culture but also meet consumers' demand for high-quality cultural products, achieving the perfect integration of cultural value and market value. This vividly interprets the connotation and value of cultural and creative design.

Curriculum integration is not a simple combination of the contents of 3D design courses and cultural and creative design courses; instead, it involves the in-depth integration of the core logics and processes of the two. The logic of "cultural exploration - creative transformation - implementation and application" in cultural and creative design provides the curriculum with rich cultural connotations and sources of creativity. The process of "technical implementation - effect presentation - scheme optimization" in 3D design, on the other hand, serves as a key means to transform cultural and creative design from a concept into an actual product. For example, in cultural and creative design courses based on 3D printing, students first integrate and transform relevant cultural elements. By conducting a systematic analysis of the design object, they extract distinctive cultural content as design focuses, and integrate cultural elements with products using artistic techniques such as extraction, decomposition and reconstruction, and grafting. Subsequently, with the help of 3D printing, an advanced 3D technology, they transform creative ideas into actual product prototypes and continuously optimize the scheme during the production process. This realizes the close coupling of the two processes (the process of cultural and creative design and that of 3D design), demonstrating the unique advantages and practical paths of curriculum integration. For example, the article *Research on the Digital Archiving and Service of Intangible Cultural Heritage Based on the Development of Cultural and Creative IP Products — A Case Study of Traditional Patterns and Motifs*, which includes four aspects: 1) the concept of development and service: multi-dimensional output and commercial monetization; 2) approaches to development and service: brand design and user participation; 3) platforms for development and service: integration of cultural and tourism industries and platform promotion; 4) promotion, service evaluation and improvement [2]. The corresponding curriculum design can also be carried out in this order, which can make students' works more in line with market needs and even enable direct sales of these works.

4. Integration Strategies of 3D Design Courses and Cultural and Creative Design

Facing the demand of the cultural and creative industry for interdisciplinary talents, 3D design courses need to break through the dilemma of "separation of technology and culture" from the three dimensions of objectives, content, and methods, and build a systematic integration path. The following is an analysis combined with university cases.

4.1 Curriculum Objective Reconstruction: Clarifying the Dual Core of "Technology + Culture"

Integrated courses need to establish a "knowledge - ability - literacy" trinity objective system. At the knowledge level, students should not only master technologies such as 3D modeling (e.g., polygon modeling), rendering (e.g., Blender Cycles rendering), and 3D printing (e.g., FDM parameter setting), but also understand the methods of cultural excavation (field survey method), creative transformation (element decomposition and reconstruction), and market analysis (user portrait) in cultural and

creative design. The "Digital Design for Cultural Heritage" course at the Royal College of Art in the UK sets knowledge objectives in this way.

At the ability level, the focus is on "full-process actual combat", requiring students to independently complete the "cultural extraction - 3D modeling - prototype production" chain and solve problems such as insufficient structural strength of 3D printing. In the "Intangible Cultural Heritage IP Cultural and Creative Development" project of the Academy of Arts & Design, Tsinghua University, students extracted elements from Su embroidery patterns for modeling and printed prototypes, which effectively improved their technology application and problem-solving abilities.

At the literacy level, it is necessary to cultivate cultural confidence and the values of "respecting culture and serving the market". In the cooperative project between the Central Academy of Fine Arts and the cultural and creative department of the Palace Museum, students are guided to balance cultural connotations and market demands through the case of "court bead headphones", and establish a correct design concept.

4.2 Curriculum Content Optimization: Building a System of "Technology Modules + Cultural and Creative Projects"

The content breaks the linear structure and is divided into three modules, with class hours adapted to the needs of cultural and creative design. Module 1: "3D Foundation Empowered by Culture" (30% of class hours). Software teaching is combined with cultural and creative cases (such as making auspicious patterns with Blender), and cultural extraction methods such as semiotic analysis are incorporated. The course "3D Image Design 1" at Wuhan Polytechnic University takes "traditional cyclotomic method" as the entry point, allowing students to understand cultural wisdom during modeling, with the core case being "3D design of auspicious patterns".

Module 2: "3D Advanced Module Oriented to Cultural and Creative Design" (accounting for 40% of total class hours) covers complex cultural and creative modeling (e.g., hand figures), 3D animation (IP short animations), and 3D printing implementation (parameter optimization, cost accounting). Soochow University has carried out cooperation with Suzhou Museum, where students designed pen holders based on the prototypes of celadon wares from the Song Dynasty. They completed the entire process of modeling, rendering, and printing, and solved the problem of balancing the restoration of cultural relics and the feasibility of 3D printing. For instance, the article A Feasibility Study on the Restoration of Musical Instruments from the Han Dynasty Based on 3D Printing and Modeling Technology proposes that 3D printing technology can be used to replicate the main bodies of musical instruments while ensuring the accuracy of their timbre. This indicates that the implementation of 3D printing in such scenarios is feasible.[3]

Module 3: "Comprehensive Cultural and Creative Project Practice" (30% of class hours), focusing on team full-process actual combat and combining themes such as "rural revitalization". Students from Zhejiang Sci-Tech University conduct research on She nationality villages, complete cultural research, market analysis, 3D cultural and creative design (such as folk IP, agricultural product packaging) through division of labor, and submit implementation plans. Some works have been recognized by cooperatives.

4.3 Teaching Method Innovation: Creating an "Immersive + Collaborative" Model

Breaking through traditional teaching, four types of innovative methods are adopted. Project-driven teaching takes real projects as the carrier. Nanjing University of the Arts cooperates with cultural and creative enterprises on "urban cultural IP design", and students complete the design according to the enterprise's needs (reflecting the Ming Dynasty culture of Nanjing), exposing them to industry processes in advance.

Interdisciplinary collaborative teaching integrates resources. In the course of the Shanghai Institute of Visual Arts, Fudan University, teachers from the History Department interpret Dunhuang culture, and teachers from the Design Department guide Maya modeling. The Feitian IP designed by students has both cultural depth and technical standards.

Immersive experience teaching allows students to enter cultural scenarios. Sichuan Fine Arts Institute organizes students to visit the Chengdu Shu Embroidery Museum, extract patterns to design cultural and creative products such as mobile phone stands, and the works are more appealing.

Online - offline blended teaching optimizes resources. Teachers from Beijing Normal University upload Blender tutorials to MOOCs for students to learn independently before class, and the classroom focuses on cultural and creative discussions and modeling guidance, improving efficiency and satisfaction.

5. Evaluation System Improvement: Establishing a "Multi-dimensional + Process-oriented" Evaluation Standard

In the practice of integrating 3D design courses and cultural and creative design, the traditional single evaluation model can no longer adapt to the dual-core training goal of "technology + culture". It is necessary to build an evaluation system with "diversified dimensions, diversified subjects, and full-process evaluation" to ensure that the evaluation comprehensively reflects students' comprehensive abilities and curriculum effectiveness.

The diversification of evaluation dimensions needs to cover the core objectives of curriculum integration and measure learning outcomes from multiple dimensions. The technical dimension focuses on the core capabilities of 3D design, and evaluates the mastery of technology through model accuracy (such as detail restoration and structural rationality) and rendering effects (such as material authenticity and light and shadow coordination); the cultural dimension focuses on the cultural core of cultural and creative design, and examines the accuracy of cultural element interpretation (such as whether it conforms to traditional connotations) and the compatibility between creativity and culture (such as whether the innovative expression does not deviate from the essence of culture); the market dimension is connected to industrial needs, and judges the practicality of products (such as whether they conform to the usage scenario) and market potential (such as the acceptance of target users); the collaboration dimension focuses on team projects, and evaluates team collaboration capabilities (such as the rationality of task allocation) and communication capabilities (such as the efficiency of demand communication). The combination of multiple dimensions ensures that the evaluation is not limited to technology but also takes into account cultural, market, and collaboration literacy.

The diversification of evaluation subjects needs to break the limitation of single teacher evaluation and integrate multi-party perspectives. Teacher evaluation focuses on the matching degree between professional capabilities and curriculum objectives; student self-evaluation and mutual evaluation can promote self-reflection and peer learning, transforming students from "evaluated objects" to "evaluation participants"; enterprise mentor evaluation introduces an industrial perspective, such as feedback from cooperative cultural and creative enterprises on the market adaptability and implementation feasibility of design schemes, making the evaluation more in line with the actual needs of the industry and avoiding the disconnection between "academic" evaluation and the market.

The full-process evaluation needs to get rid of the "result-oriented" approach and track the entire learning process. From the depth of research in the "cultural research" stage, the innovation of the scheme in the "creative conception" stage, to the technology application in the "3D modeling" stage, the problem-solving ability in the "prototype production" stage, and then to the iteration efficiency in the "scheme optimization" stage, students' performance is recorded throughout the process. This not only focuses on the quality of the final work but also attaches importance to the ability growth and thinking development in the process, which more objectively reflects students' learning trajectory and the actual effect of curriculum integration.

6. Conclusion

This research still has limitations in two aspects. Firstly, the sample of practical cases only covers the Visual Communication Design major of one university, and does not involve 3D design courses

of different levels (such as undergraduate and higher vocational education) and different types (such as product design and animation design). As a result, the universality of the research results needs to be further verified, and the adaptability of the integration strategy in other scenarios cannot be fully determined. Secondly, the evaluation of the curriculum integration effect mostly focuses on short-term feedback after the course (such as students' self-evaluation of abilities and course scores), and there is no long-term follow-up analysis of students' career development in the cultural and creative field after employment (such as post adaptability and professional competitiveness), making it difficult to fully measure the impact of the integrated curriculum on students' long-term development.

7. Future Outlook

In view of the research shortcomings and industry development trends, future research can be promoted from three aspects. Firstly, expand the research scope, promote the integration model in 3D design courses of different levels of colleges and universities (such as undergraduate and higher vocational education) and different majors (such as product design and animation design), and verify the universality of the integration strategy and optimize the adaptation plan through multi-case comparative analysis. Secondly, deepen school-enterprise cooperation, and jointly establish a "university - cultural and creative enterprise - cultural institution" collaborative education mechanism with cultural and creative enterprises, museums, intangible cultural heritage institutions, etc., to integrate cultural resources, technical resources, and market resources, and provide more comprehensive resource support for curriculum integration. Thirdly, keep up with the development trend of digital technology, explore the integration paths of new technologies such as the meta-universe and AI design with 3D design and cultural and creative design, such as using AI to assist in the extraction of cultural elements and using the meta-universe to realize the virtual display of cultural and creative products, so as to promote the continuous innovation of curriculum content and teaching models and cultivate design talents more adapted to the needs of the digital cultural and creative era.

References

- [1] Cui, L. The Application of Artificial Intelligence 3D Modeling Technology in the Digital Protection of ICH Production Tools [J]. *Technology Innovation and Application*, 2025, 15 (25): 189-192. DOI: 10.19981/j.CN23-1581/G3.2025.25.043.
- [2] Wang, N., Wu, J. F., & Song, D. Y. Research on the Digital Archiving and Service of Intangible Cultural Heritage Based on the Development of Cultural and Creative IP Products — A Case Study of Traditional Patterns and Motifs. [J]. *Archives Management*, 2023, (04): 61-63. DOI: 10.15950/j.cnki.1005-9458.2023.04.008.
- [3] Li, S. Z. A Feasibility Study on the Restoration of Musical Instruments from the Han Dynasty Based on 3D Printing and Modeling Technology [J]. *Screen Printing*, 2024, (06): 74-76. DOI:10.20084/j.cnki.1002-4867.2024.06.020.