Research on the Reform of Design Workshop Course Teaching-Taking the Course of New Technology and Application of Ceramics as an Example

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Abstract: Addressing the misalignment between the theoretical and practical aspects of traditional craft education and the challenges in integrating digitalization with traditional craftsmanship, this study explores a design workshop-based curriculum reform pathway in the course "New Technologies and Applications of Ceramics". Grounded in the characteristics of the traditional craftsmanship, technological innovation, customization, and creativity, the reform establishes a three-stage teaching cycle: "Skill Foundation Stage, Technology Empowerment Stage, and Creative Integration Stage". By anchoring a three-dimensional goal system—"taking traditional craftsmanship as the core, technological empowerment as the engine, and global perspective as the coordinate" — the curriculum achieves the deep integration of ceramic-making heritage inheritance, 3D printing technology application, and creative design. The reform effectively addresses shortcomings in traditional teaching, yielding diverse outcomes including design exhibitions, design patents, and competition awards. It establishes a comprehensive mechanism for transforming teaching achievements, enhancing students' comprehensive abilities and course quality while providing a replicable teaching reform model for similar practical courses in design disciplines.

Keywords: Design Workshop; Ceramic 3D Printing; Course Evaluation; Teaching Model

The traditional porcelain-making techniques in Jingdezhen face a dual challenge of "preserving tradition" and "innovation" in modern classroom teaching. On one hand, classroom instruction relies heavily on theoretical knowledge, while skill transmission depends on oral and hands-on teaching, creating a disconnect between practical inheritance and pedagogical practice. On the other hand, digital design education under new technological conditions struggles to integrate with traditional craftsmanship, leading to insufficient cultivation of interdisciplinary design talents. Design workshops, characterized by a strong practical orientation and design outcome orientation, can effectively remedy the deficiencies of traditional teaching. By establishing a comprehensive course evaluation system, they enable the full realization of new technology-driven ceramic creative product design objectives, thereby serving as an effective vehicle for curriculum reform.

1.Design Workshop Course Teaching Overview

In 2016, the Product Design program at Jingdezhen Ceramic University pioneered the undergraduate course "New Ceramic Technologies and Applications" nationwide, aligned with the advancements in ceramic product design and the talent development needs of the industry. This 64-hour, 4-credit course is supported by a syllabus designed to expand the application scenarios for additive manufacturing and other emerging technologies in ceramic design and education, while cultivating students' ability to apply innovative technologies to ceramic product design. Guided by objectives of "modernizing traditional porcelain-making techniques," "integrating technology with art," and "promoting international exchange of ceramic culture," the course bridges traditional craftsmanship with modern design and domestic/international collaborative teaching. It emphasizes hands-on practice in designing and producing ceramic products under new technological conditions, aiming to establish the course as a core practical platform for teaching traditional techniques while exploring innovative approaches to design methodology. In 2018, the course was piloted for 32 students majoring in Industrial Ceramics under the 2015

Product Design program, achieving anticipated outcomes. Building on this success, the university launched a workshop-style curriculum reform in April 2019. The workshop team comprises faculty and teaching assistants: instructors focus on traditional ceramic techniques including clay preparation, glazing, and kiln firing, while teaching assistants assist with digital design, application of new ceramic technologies, and equipment calibration. Clear evaluation criteria were also established for the course.

2.Characteristics of the Workshop-style Course "New Technologies and Applications of Ceramics"

Unlike traditional design courses, this program requires both theoretical guidance and practical application, as well as the integration of new technologies to ensure cutting-edge and contemporary design practices. The course is characterized by the following features:

2.1 Traditional craftsmanship

The course adheres to Jingdezhen's traditional porcelain-making techniques, using locally sourced Jingdezhen clay with exceptional plasticity. Each piece is hand-glazed and fired in open-air kilns. This design process rooted in traditional craftsmanship ensures high firing success rates while preventing risks like unburnt clay or imperfect techniques. Moreover, it preserves cultural authenticity by integrating traditional elements. Through hands-on porcelain-making and design appreciation, students gain firsthand experience of traditional porcelain-making logic, fostering a conscious appreciation of ceramic aesthetics and cultural heritage.

2.2 Technological Innovation

The workshop-based curriculum adopts an additive manufacturing approach, focusing on ceramic 3D printing's layer-by-layer deposition process. This workflow encompasses digitalization of ceramic products, slicing and parameter optimization, modern manufacturing techniques for printing, and final firing and post-processing. Developed through advanced ceramic 3D printing technology, this innovative method ensures contemporary design expression and precise craftsmanship. Moreover, it transcends traditional modeling constraints by enabling direct 3D printing of hollow structures, parametric textures, and complex geometries. This breakthrough allows ceramic 3D printers to creatively address limitations of manual shaping while meeting standardized design and manufacturing requirements, achieving a balance between technical efficiency and traditional craftsmanship.

2.3 Customization

As a new technology of 3D printing, it is based on digital model and manufacturing process, which has the characteristics of small-batch production, so it can meet the needs of consumers for personalized products. It can realize the needs of modern ceramic industry for high precision, small-batch and customization by modifying parameters, and it also cultivates the urgently needed design talents for the industry.

2.4 Creativity

The innovative technological features and customizable nature of the course highlight the creative essence of ceramic design, seamlessly integrating traditional culture, cutting-edge technologies, and contemporary design needs. Through creative thinking exercises, the curriculum cultivates students' ability to develop multidimensional perspectives-spanning cultural, market, and artistic dimensions-to create ceramics that meet modern consumer demands while achieving both artistic excellence and practical functionality.

The distinctive features of the "New Technologies and Applications in Ceramics" workshop-style course facilitate the implementation of workshop-based teaching through traditional craftsmanship, while leveraging new technologies to transcend the limitations of conventional manual porcelain production. Moreover, it addresses future customization demands by driving the transformation of educational outcomes through instructional design, thereby achieving comprehensive improvements in curriculum delivery across multiple dimensions, including talent quality cultivation, cultural heritage preservation, and innovative practice capabilities.

3.The Implementation of Design Workshop Course Teaching

Design workshops differ from traditional teaching methods that emphasize theory with

limited hands-on practice. The "New Technologies and Applications in Ceramics" workshop adopts a core framework of "Skill Foundation – Technology Empowerment – Creative Integration," combining traditional porcelain-making techniques with digital production processes. This dual-path approach creates a "spiral progression and art-science synergy" teaching loop, structured into three distinct phases.

Phase 1: Foundational Skills (1 week) — Upholding Tradition

The teacher teaches Jingdezhen traditional porcelain making craft and Jingdezhen traditional ceramic cultural connotation, and takes it as the main technical route of workshop-style teaching practice. Meanwhile, through the design case of international new ceramic technology, the teacher inspires students to think about the innovative expression of traditional craft in the modern times, aiming to consolidate the foundation of traditional craft.

Phase 2: Technology Empowerment (2 weeks) — Technical Empowerment

The design workshop focuses on the integration of ceramic 3D printing with traditional craftsmanship, employing a "problem-oriented" approach to inspire students to actively explore technology-enhanced solutions, ensuring technology serves as a catalyst rather than a mere tool. During this phase, digital design methods are primarily utilized to create ceramic product blanks through both direct and indirect 3D printing techniques. Students are organized into groups to conduct computer-aided design, digital data collection, and 3D printing practices. The emphasis is on cultivating students' hands-on skills in innovatively applying new technologies to shape blanks and identify and resolve practical challenges.

Phase 3: Creative Integration (1 week) – Creative Expression

Building on mastery of new technologies and techniques, this program integrates innovative thinking to develop creative ceramic design practices. It facilitates students 'transition from "technical proficiency" to "creative expression," achieving a deep integration of tradition and modernity, as well as local and global perspectives. Through workshop-style instruction, the program focuses on cultivating students' creative thinking and expressive abilities, enabling them to innovate ceramic designs from an international design perspective. The above three stages are carried out and implemented in a relatively concentrated way through workshop-style curriculum teaching, thus constructing a sustainable development contemporary ceramic design workshop-style curriculum teaching implementation path of "based on local—embrace technology—face the world".

4. Innovative Paradigm of Design Workshop Course Teaching Reform

4.1 Practice-oriented Goals of Multidimensional Collaboration

The workshop-style curriculum design establishes a three-dimensional framework anchored by "traditional ceramic craftsmanship as the core, technological empowerment as the engine, and global vision as the compass" (Figure 1). By grounding innovation in traditional techniques while preserving the essence and cultural legacy of ceramics, this approach significantly enhances the international recognition of ceramic designs. The integration of technology as an innovation driver revolutionizes product design and manufacturing processes, elevating the creative experience. With a global perspective, it addresses cultural diversity and modern design principles, fostering creativity in ceramic products. Ultimately, this framework establishes a "goal-practice-achievement" oriented paradigm for the "Preserving Traditional Techniques and Innovating — Synergizing Science and Art" workshop-style curriculum.

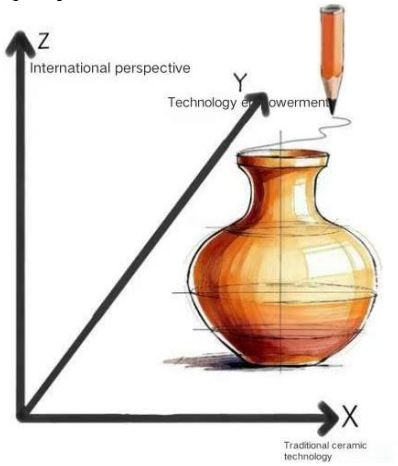

Figure 1 Three-dimensional Target System of Workshop-style Curriculum Teaching

4.2 Designing Workshop-style Curriculum

Teaching Practice Model

With the advancement of additive manufacturing technology, ceramic 3D printing has become an increasingly prevalent technique for shaping ceramic products, widely adopted in design, production, and educational applications. This cutting-edge process utilizes digital design methods to build three-dimensional models by layering ceramic materials (such as slurries or powders) into solid structures. Unlike traditional casting or greenware forming techniques, it achieves complex configurations without mold assistance, making it particularly suitable for teaching scenarios in ceramic art and design.

4.2.1 Innovation in the Process Flow of New Ceramic Technology

The current development of ceramic 3D printing technology has given rise to diverse manufacturing approaches based on different technical principles. Depending on raw materials, these methods can be broadly categorized into two types: powder-based ceramic 3D printing and slurry-based molding. The former typically employs laser sintering or binder bonding to layer ceramic powders, suitable for precision manufacturing. The latter resembles traditional ceramic hand-building techniques, where 3D printers precisely control extrusion paths to build up layers of ceramic material, creating three-dimensional prototypes. This method ensures faithful reproduction of design concepts while enabling broader participation in ceramic design practices. In workshop-style design education, existing equipment is utilized to implement direct ceramic 3D printing processes. By directly extruding and layering clay using 3D printers, this approach achieves data consistency between computer-generated virtual prints and physical ceramic outputs.

4.2.2 Innovation in Course Outcomes

Through a four-week workshop-style teaching program, we not only addressed issues like insufficient digitization of traditional crafts and lack of design creativity, but also successfully organized a ceramic 3D printing exhibition, published an outstanding portfolio of workshop works, filed multiple design patents, and won several design competition awards. (Figure 2)

Figure 2. Design Workshop Course Exhibition Open to the Public

4.2.3 Innovation of Teaching Achievement Transformation Mechanism

Unlike traditional teaching that prioritizes theory over practice and process over outcomes, the design workshop approach emphasizes creating tangible educational results and establishing industry transfer mechanisms. Through initiatives like exhibitions and collaborative ceramic product development with enterprises, this methodology enables creative practices to serve curriculum design, industrial production, value creation, and aesthetic needs—ultimately ensuring classroom learning outcomes take root in real-world applications.

5.Conclusion

The design workshop-style curriculum reform contributes to the theoretical development of design studies. Guided by the new technology of ceramic 3D printing, it also provides a reference model for similar courses. This approach not only effectively addresses the lack of practicality in traditional teaching but also enhances the quality of talent cultivation and the efficiency of design achievement transformation.

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References

[1]Mingchun ZHANG, Ling YANG. Ceramic Product Forming Technologies Research Based on 3D Printing[J]. IEEE

ACCESS.2016(12).
[2]Tang Yi De. Translated by Han Lian Qing. Technology and the World of Life [M]. Beijing: Peking University Press, 2012.45-68，123-141.
[3]Martin Heidegger. Being and Time [M]. Beijing: Sanlian Bookstore (Life, Reading, and New Knowledge), 2014.79-95，201-218.
[4]Stiegler. Technology and Time [M]. Beijing: Yilin Press, 2023.53-72.
[5]Nikola Negroponte. Digital Living[J]. Beijing: Electronic Industry Press, 2017.38-57 ， 112-129.

