HUMAN-MACHINE COLLABORATION AS A PATHWAY TO REFORM IN ART AND DESIGN EDUCATION IN THE AGE OF ARTIFICIAL INTELLIGENCE: THE CASE OF CHINESE UNIVERSITIES

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Abstract. *From the perspective of human-machine collaboration, this paper analyzes the structural problems currently present in China's university-level art and design education, examines the opportunities and challenges that AIGC-driven developments bring to talent cultivation, and draws on distributed cognition and constructivist learning theory to propose a reform framework encompassing four dimensions: training objectives, curriculum systems, teaching platforms, and evaluation mechanisms.*

Keywords: *AI-generated content, art and design education, human-machine collaboration, curriculum reform.*

In late 2022, generative AI tools such as ChatGPT and Midjourney entered public view, triggering a deep and ongoing transformation in the field of art and design. By 2025, Zhejiang Sci-Tech University had partnered with Alibaba Cloud to introduce the PAI Art Lab platform into its cultural innovation design course, developing a series of AI-powered cultural and creative products with Xinjiang regional characteristics under the theme "Culture Enriches Xinjiang." This marked a shift from experimental application to systematic integration of AIGC technologies into teaching practice.

At present, art and design education in Chinese universities faces three major challenges. First, there is a disconnect between course content and real-world practice. Most institutions update their curricula only every three to five years, leaving syllabi centered on classical design theory, traditional software skills, and basic form training, while investing little in instruction around cutting-edge digital tools like AIGC. The rigid disciplinary boundaries and modular structure of curricula further prevent graduates from gaining a competitive edge in actual work environments. Second, pedagogical methods tend to prioritize means over ends. A significant portion of class time is spent drilling students on specific tools to complete assigned tasks, forcing them to passively follow predetermined procedures and design formulas. As a result, room for individual exploration and critical thinking is severely limited. In the execution phase, excessive emphasis is placed on the polish and visual appeal of final outputs, while the logical reasoning and conceptual

development behind the work are largely overlooked. Third, evaluation systems are narrow and one-sided.

Opportunities and Challenges for Design Education Driven by AIGC

AIGC technologies bring multiple opportunities to university-level art and design education, including improved efficiency, interdisciplinary integration, enhanced hands-on practice, and personalized learning. In terms of efficiency, AIGC tools can be applied across the entire cycle of teaching, learning, and assessment. Students can generate highly complex, stylistically diverse visual images and layout solutions with impressive technical quality in a matter of seconds through command-based, conversational interactions, freeing them from repetitive tasks and allowing them to devote more energy to creative ideation. On the interdisciplinary front, AIGC breaks down traditional barriers between art and design, computer science, data analysis, and other fields, providing a technological foundation for cultivating composite design thinking. In terms of practical training, the industry knowledge graphs constructed by AIGC can accurately capture the evolving demands of the industry's competency matrix, enabling curriculum restructuring to stay aligned with market needs. For personalized learning, intelligent adaptive systems based on deep learning can push individualized resources according to students' learning behavior data, offering a concrete realization of the ancient principle of teaching according to aptitude through modern technology.

Given the above opportunities and challenges, art and design education in higher education institutions requires systemic restructuring across four dimensions: training objectives, curriculum systems, teaching platforms, and evaluation mechanisms.

The application of AIGC has liberated designers from basic and repetitive tasks, driving a fundamental shift in the goals of talent cultivation. Skills that once occupied a central place in traditional education—such as hand-drawing and software operation—are being partially replaced by AI in terms of their instrumental value. Mere technical proficiency no longer constitutes a core competitive advantage. The focus of talent development must therefore move upstream to the stage of creative planning. The core competency of future designers will lie in human-machine collaborative thinking—that is, the ability to act as a prompt strategist, precisely defining design problems and strategically using AI tools for concept divergence and solution iteration.

Based on this shift, training objectives can be updated across three dimensions—cognitive, competency-based, and affectiveThe cognitive layer serves as the foundation, requiring students to develop a dynamic, ecological understanding of "technology plus design" along with critical thinking. The competency layer acts as the backbone, focusing on cultivating students' ability to master and collaborate with AI, their core creativity, and their capacity for solving complex problems. The affective layer guides the direction in which these competencies are applied, fostering a rational view of technology and a sense of ethical responsibility. These three layers support one another, together shaping future design professionals who can navigate technological change while exercising critical creativity.

To support the new training objectives, the instructional system should evolve from art–technology integration toward project-driven approaches. On the technical awareness side, courses should break down disciplinary boundaries by incorporating perspectives such as "AI + Design + Humanities," adding offerings like AIGC design tool applications, art and technology, digital design, AIGC ethics, data privacy, and intellectual property. For thinking training, workshop formats can guide students through the transition from tool operator to prompt strategist. In terms of teaching models, real industry design projects are introduced into the classroom, allowing

students to participate in AI-driven design processes, thereby forming an industry–education integration model where “the classroom becomes R&D, and assignments become products.”

Take brand design instruction in visual communication as an example. In the early stage, students use AI to conduct market and user trend analysis, explore a wide range of styles, and generate concept sketches. In the middle stage, they are guided to deepen core graphics using parametric AIGC tools and test the adaptability of identity systems through dynamic simulation. In the later stage, AI tools help generate complete brand application scenarios and user touchpoint models. Throughout this process, emphasis is placed on sharpening students’ ability to refine AIGC prompts, critically evaluate generated outputs, and connect and make decisions across different technical tools.

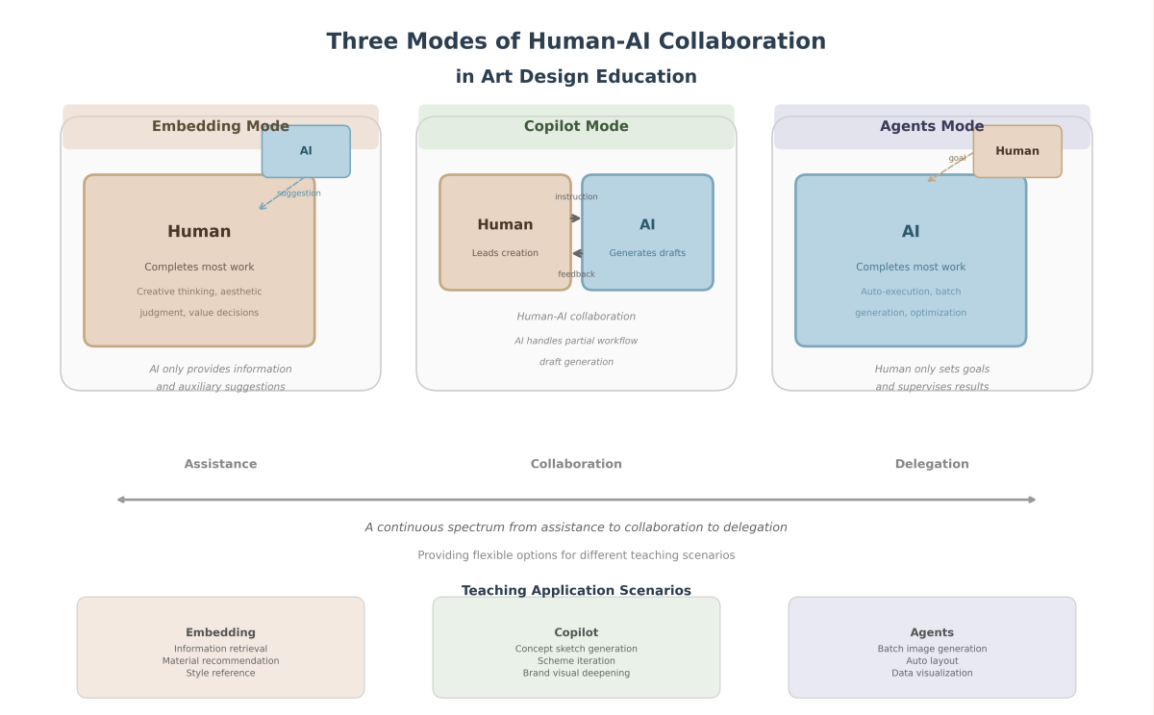
With its low barrier to entry and high efficiency, AIGC has already become deeply embedded in university-level art and design education. Going forward, institutions can build proprietary corpora and train vertical-domain models to create integrated intelligent design platforms, offering full-chain instructional support—from cultural decoding to human-machine collaborative training—for both teachers and students. At the tool level, platforms such as Adobe Firefly and Stable Diffusion WebUI can be introduced for AIGC teaching and training, with a focus on guiding students in prompt design, iterative refinement, and correction logic.

It is worth noting that AIGC shows unique value in the digital translation of traditional cultural elements. Take the development of Xinjiang-themed cultural and creative products as an example. The design team first systematically cataloged and digitized Uyghur traditional patterns, architectural decorative motifs, and folk crafts, building a cultural gene bank that includes color palettes, pattern structures, and semantic associations. Using diffusion models, they then performed style transfer and redesign, transforming traditional patterns into visual symbols that resonate with contemporary aesthetics. These were eventually applied to product categories such as lamp packaging, textile-based cultural goods, and apparel accessories. This practice not only demonstrates the feasibility of AIGC in cultural heritage and innovation but also provides design education with a complete teaching case study of “cultural decoding → technical translation →product implementation.”

Figure 1 New Xinjiang Elements Series of AI Cultural Products

Currently, three typical models of human-machine collaboration have emerged in art and design education, as shown in Figure 2. In the Embedding model, humans perform most of the work while AI merely provides information or suggestions. In the Copilot model, humans and AI collaborate on tasks, with AI taking on part of the workflow to generate initial drafts. In the Agents model, AI handles the vast majority of the work, while humans set goals and oversee outcomes. Together, these three models form a continuum ranging from assistance to

collaboration to delegation, offering flexible options for different teaching scenarios. Figure 2 Three Modes of Human-Machine Collaboration



Here's the English translation, written to sound natural and avoid AI-like phrasing:

Application scenario	**Typical tool**	**Human-machine collaboration mode**	**Core Competency Requirements**	**Main challenges**
Concept sketch generation	Midjourney Stable Diffusion	Copilot mode	Concise prompts, aesthetic judgment	Originality definition, style homogenization
Brand Visual System	Adobe Firefly、Canva	Embedding+Copilot	Systematic thinking, strategic decision-making	Brand consistency maintenance
Traditional culture translation	Custom diffusion model	Copilot mode	Cultural decoding, symbol transformation	Cultural misinterpretation, ethical controversy
Dynamic Interactive Design	Runway、Pika Labs	Agents mode	Logical architecture, user experience	Technical barriers, iteration costs
Teaching evaluation assistance	Intelligent Adaptive Platform	Embeddingmode	Data analysis, standard formulation	Privacy protection, algorithm bias

Given the impact of AI tools on traditional assignment evaluation, the assessment of talent development needs to shift its focus toward transparent evaluation of the entire creative process.

Depending on the discipline, digital literacy portfolios can be developed, with AIGC teaching and training platforms automatically logging key decision points throughout the creative process—including initial design concepts, iterations of prompts, and records of filtered results. During evaluation, different indicators such as originality of ideas, degree of human-machine collaboration, and embodiment of value rationality are assessed separately, enabling multi-dimensional evaluation.

In addition, a "four-party collaborative evaluation" mechanism can be established: instructors oversee academic standards, students engage in peer review, industry mentors provide feedback from a market perspective, and AI platforms collect real-time learning behavior data to generate visual radar charts. This creates an evidence chain combining both process and outcome data, ensuring that evaluation addresses not only creative depth but also commercial viability. The fundamental shift here is moving from "judging the work" to "tracing the thinking," and from "focusing on outcomes" to "valuing the process."

Conclusion

The impact of AIGC on art and design education in higher education institutions is, at its core, a profound inquiry into what it means to design. When machines can efficiently carry out creative generation tasks that were once exclusively human, the central value of design education shifts from teaching students how to make things to guiding them in how to think. The human-machine collaborative reform pathway proposed in this paper is not simply about replacing traditional teaching with technology. Rather, it attempts to redefine the collaborative relationship among teachers, students, and intelligent tools within the frameworks of distributed cognition theory and constructivist learning theory. Future design education should cultivate a new type of talent—one capable of harnessing intelligent technology while holding fast to the humanistic spirit. These individuals understand the limits of technology, maintain a deep insight into the essence of art, and retain the initiative in value judgment throughout human-machine collaboration.

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