Research on the Three-dimensional Ability Training Path of Packaging Design Talents in the Era of AIGC

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Abstract. Artificial Intelligence Generated Content (AIGC) technology is revolutionizing the packaging design industry while presenting new challenges for talent cultivation in higher education. This study, based on a university-industry collaboration between Liaoning Communication University and Shenyang Yujun Education Consulting Co., Ltd., addresses issues in traditional training models such as outdated curricula and disconnection from practical applications by establishing a three-dimensional competency development framework integrating technology, creativity, and practice. The technological dimension focuses on AIGC tool applications and intelligent design thinking, the creative dimension emphasizes interdisciplinary integration and critical innovation, while the practical dimension prioritizes real-world project implementation and industry collaboration. Through multidimensional approaches including curriculum restructuring, platform development, faculty empowerment, and innovative evaluation systems, this research explores new models for applied talent cultivation under industry-education integration, providing actionable paradigms for design education reform in the intelligent era.

Keywords: AIGC; Packaging Design; 3D Skills; Industry-Education Integration; Talent Development.

1. Introduction

Artificial intelligence has now become the driving force behind industrial transformation. In packaging design, AIGC technology has evolved from an auxiliary tool to a creative collaborator, permeating the entire workflow from concept generation and structural optimization to visual presentation [1]. The global packaging industry continues to grow steadily, with AIGC applications significantly boosting design efficiency and reducing corporate costs. However, current packaging design education still faces multiple challenges: curriculum design prioritizes theory over practice, teaching methods remain traditional, evaluation systems are overly simplistic, and there is insufficient exploration of new technologies like AIGC. This training model results in graduates taking longer to adapt to job requirements, making it difficult to meet the demands of industrial upgrading.

As a leading media and arts institution in Northeast China, Liaoning Media College has been actively expanding its interdisciplinary programs in artificial intelligence and art design in recent years. In 2025, the college partnered with Shenyang Yujun Education Consulting Co., Ltd. to apply for the Ministry of Education's Supply-Demand Employment Education Project, which aims to cultivate high-quality applied talents equipped with AI-powered design tools, innovative thinking, and industry-ready skills through AIGC technology. This study is grounded in the practical insights and theoretical synthesis derived from the project's implementation.

2. Analysis of the Ability Demand of Packaging Design Talents in the AIGC Era

2.1 Industrial Transformation Drives the Transformation of the Capability Structure

According to relevant policy documents and industry research, intelligent packaging, green packaging, and safe packaging have become the primary directions for industrial upgrading [2]. Enterprises now exhibit three new characteristics in talent demand: First, technical proficiency–requiring mastery of mainstream AIGC tools like Stable Diffusion and Midjourney for rapid concept generation, understanding fundamental principles such as generative adversarial networks and prompt engineering, and applying AI for market analysis and user insights. Second, innovative thinking patterns–AIGC has disrupted traditional linear creative processes, demanding designers' ability to critically evaluate AI solutions while maintaining creative leadership in human-machine collaboration. This mindset transcends simple software operation, integrating technical comprehension, artistic aesthetics, and business acumen. Third, collaborative capabilities – requiring understanding of the entire design-to-production chain, including smart printing processes, digital twin validation, and supply chain coordination. Companies expect designers to participate in the complete workflow from initial market positioning, mid-term technical implementation, to final user experience optimization.

2.2 Theoretical Construction of Three-dimensional Capability Model

Building on Bloom's Taxonomy of Educational Objectives and industry needs mapping, this study constructs a "Technology-Creative-Practice" three-dimensional competency model. The Technology dimension encompasses AIGC tool operation skills, understanding of intelligent design principles[3], and data-driven decision-making capabilities. This dimension emphasizes instrumental rationality, addressing how to efficiently utilize technology. The Creative dimension covers iterative design thinking skills, interdisciplinary knowledge integration, and critical innovation capabilities. This dimension emphasizes value rationality, addressing why to innovate and how to innovate. The Practice dimension includes real-world project transformation skills, teamwork and communication abilities, and professional ethics awareness. This dimension emphasizes practical rationality, addressing how to implement solutions and for whom to serve[4]. The three dimensions exhibit a spiral upward relationship: Technology provides the means to realize creativity, creativity guides the direction of practice, and practice feedback drives technological iteration, forming a closed-loop ecosystem for competency development.

3. Construction of Three-dimensional Ability Training System of "Technology-Creativity-Practice"

3.1 Technical Dimension: Constructing Three-level Capability Chain

The foundational level focuses on tool mastery and cognitive training, embedding AIGC modules into the first-year software fundamentals curriculum to teach core operations of mainstream tools. Task-driven methodologies are employed through localized design projects, requiring students to generate multiple AI-generated proposals for iterative refinement. This phase emphasizes developing essential skills like prompt writing, parameter tuning, and style control, building technical intuition through extensive hands-on practice. The intermediate level prioritizes theoretical understanding and practical integration, introducing principles like generative adversarial networks and variational autoencoders in second-year packaging design courses, alongside specialized modules on AI-assisted design. Real-world project databases from partner companies are incorporated, enabling students to complete end-to-end workflows from requirement analysis to proposal evaluation using AIGC tools. This stage highlights human-machine collaborative decision-making, where students develop design strategies, refine proposals, and validate technical feasibility—avoiding becoming mere technical followers. The advanced level focuses on technological innovation, offering workshops for top students to explore secondary development of AIGC platforms, such as creating region-specific cultural models or intelligent evaluation systems for packaging designs. Outcomes include technical reports and software prototypes, aiming to cultivate visionary talents capable of both using and creating tools.

3.2 Creative Dimension: Implementation of Three-dimensional Expansion

The Design Thinking Iterative Training program employs Stanford University's Design Thinking framework, structured into five-phase workshops: Empathy, Definition, Conception, Prototyping, and

Testing[5]. During the Conception phase, students are required to generate multiple proposals using various AIGC tools and conduct cross-review to cultivate diverse perspectives. This process breaks reliance on single tools, facilitates cognitive leaps, and enables students to maintain critical thinking and initiative with AI assistance. Interdisciplinary knowledge mapping adopts an integrative teaching philosophy, constructing a "Packaging Design+" knowledge module: integration of packaging and materials science (biodegradable material applications), packaging and marketing (user persona analysis), packaging and information technology (smart label design). Regularly invited cross-disciplinary experts including corporate branding strategists and materials engineers co-teach to create creative synergy. Critical innovation value shaping addresses potential copyright infringement and cultural bias issues in AIGC through specialized design ethics seminars. Case-based teaching methods explore topics like copyright ownership of AI-generated content and regional cultural misinterpretation caused by algorithmic bias. Through debates and role-playing, students develop value judgment skills for ethical technology adoption, becoming responsible practitioners of intelligent design.

3.3 Practice Dimension: Building a Three-level Progressive Platform

The Simulation Layer utilizes AIGC to build a digital twin training system that replicates real-world business environments. The system features an integrated virtual brand project repository covering multiple categories, with each project containing parameters such as budget, process, and user requirements[6]. After students receive online orders, AI assumes the role of a client to communicate requirements, while the system evaluates feasibility and innovation of proposed solutions. This platform addresses the challenge of insufficient corporate projects, enabling students to complete extensive virtual project training during their academic years. The Realization Layer introduces commercial projects from partner enterprises each semester through a dual-mentor system. Corporate mentors handle requirement communication and technical reviews, while university faculty provide theoretical guidance and process management. Upon project completion, students must submit a post-mortem report analyzing AI tool efficiency, creative contributions, and collaboration bottlenecks, achieving a closed-loop learning experience. The Transformation Layer establishes a design incubation phase in the third academic year, where outstanding projects may apply for innovation and entrepreneurship funds to pursue patent applications, prototype production, and market promotion. Collaborative achievement showcases are held with industrial parks, inviting corporate and investment institutions to participate. Students are encouraged to participate in competitions like the Challenge Cup, showcasing AIGC-assisted design processes as innovative highlights to enhance public visibility.

4. Implementation Strategy of Three-dimensional Ability Training Path

4.1 Curriculum System Reconstruction: From Parallel to Integration

Breaking away from traditional linear course structures, we have established a three-dimensional immersive curriculum matrix. The semester schedule features parallel advancement of technical, creative, and practical courses, with integrated comprehensive projects implemented annually. Key initiatives include developing the "AI+Packaging" specialized module by embedding intelligent design units into packaging design courses; creating a dynamic case library with real-time updates of AIGC-assisted design examples for pre-class self-study; and implementing a credit recognition reform that allows awards from competitions and corporate project completion to be converted into practical credits, thereby enhancing student motivation. Through deep curriculum integration, we achieve an organic unity of knowledge transmission, skill development, and holistic quality enhancement.

4.2 Practice Platform Building: From Single to Ecology

The campus-based Intelligent Design Workshop has upgraded its facilities with high-performance graphics workstations, professional software installations, and localized AI training environments. The workshop operates on an open reservation system, allowing students to use resources independently while the system automatically records usage data for formative assessment. Off-campus industry-academia integration bases leverage corporate resources to establish smart packaging design industry-academia-research hubs. These facilities provide on-site guidance from corporate mentors, real-world project design, new technology training, and industry standard discussions. Agreements stipulate that enterprises offer internship positions and prioritize hiring outstanding students. The Cloud Collaborative Innovation Platform utilizes online collaboration tools to build remote school-enterprise systems. Corporate mentors can provide real-time feedback on student proposals, while the AI system records key comments, generates competency growth maps, and visualizes three-dimensional skill progression curves to facilitate personalized tutoring.

4.3 Empowerment of Teachers: From Single Type to Dual Teachers and Dual Abilities

The Teacher AIGC Competency Enhancement Program regularly organizes AI design technology sharing sessions and invites industry experts for training. Selecting key teachers to attend professional development workshops and obtain technical certifications. Establishing technical practice archives for teachers, requiring them to complete AIGC-assisted design enterprise projects annually to ensure alignment between teaching and industry. Corporate Mentorship Development: Providing pedagogical training for mentors assigned by partner enterprises, covering curriculum design, classroom discussion organization, and academic evaluation. Corporate mentors must submit teaching design proposals, which are reviewed by the school before implementation, addressing the issue of corporate experts being " skilled but not adept at teaching. " Dual-Mentor Collaboration Mechanism: Innovatively establishing a collaborative model where school teachers and corporate mentors jointly guide student teams. Both parties have clearly defined responsibilities: school teachers focus on theoretical depth and academic standards, while corporate mentors concentrate on technical feasibility and market adaptability. Regular joint teaching research meetings are held to share student progress and adjust strategies promptly.

4.4 Evaluation System Innovation:From Result-oriented to Value-added-oriented

We construct a three-dimensional evaluation matrix: The technical dimension assesses proficiency in evaluation tools, generation efficiency, report quality, and development capabilities; the creative dimension evaluates cognitive agility, knowledge application, innovation value, and cultural depth; the practical dimension measures project completion, collaborative performance, client satisfaction, and conversion potential. Introducing multi-stakeholder evaluation replaces the traditional teacher-centered grading model, establishing a collaborative system involving school faculty, corporate mentors, AI systems, and peer reviews. AI systems analyze student proposals to provide multi-dimensional quantitative scores as supplementary references. Implementing value-added evaluation focuses not only on final projects but also on students' competency growth. By comparing baseline assessments with project-end evaluations, we calculate competency growth indices to incentivize significant progress and encourage self-transcendence.

5. Practice Effect and Reflection

5.1 Summary of Interim Results

In talent development, the first cohort of students has mastered multiple AIGC tools, achieving significantly improved solution generation efficiency and a high award-winning rate in provincial-level design competitions. A substantial proportion of students secured internships at partner enterprises and were offered permanent positions. Curriculum development includes the creation of school-based textbooks and online micro-lectures, the establishment of a dynamic case library, and the integration of courses approved as provincial first-class undergraduate programs, with teaching content continuously updated. Faculty development features project team members publishing research papers, filing patents, and demonstrating enhanced technical proficiency, while corporate mentors' teaching capabilities improved markedly after training, elevating collaborative education quality. Industry services involve completing multiple real-world enterprise projects, with some outcomes implemented in production to reduce costs, and hosting regional intelligent packaging design forums to facilitate industry-academia-research collaboration.

5.2 Existing Problems and Improvement Direction

Technical ethics education remains underdeveloped, with some students exhibiting technological overreliance and insufficient awareness of copyright ownership and cultural sensitivity. Mandatory design ethics courses should be introduced to strengthen value-based guidance. Hardware infrastructure requires upgrades, as current computing power struggles to meet large-scale model training demands, necessitating special funding for AI supercomputing centers. Insufficient stability in corporate mentorship, with temporary course adjustments due to busy schedules, calls for establishing a talent pool of industry experts to ensure teaching continuity. The absence of long-term tracking mechanisms and short project monitoring cycles hinder career development observation for graduates. A graduate growth portfolio will be created to continuously collect employer feedback, forming a dynamic optimization mechanism for training programs.

6. Practice Effect and Reflection

This study establishes a three-dimensional competency development framework for packaging design professionals in the AIGC era, integrating technical, creative, and practical skills. Through industry-academia collaboration at Liaoning Communication University, the system has proven effective in enhancing training quality and bridging the talent gap. Its core contributions include: 1) Theoretical innovation with a three-dimensional competency model, enriching design education theories for the digital age; 2) Practical implementation of a replicable industry-education integration model, serving as a reference for peer institutions; 3) Mechanistic advancement through diversified evaluation tools, driving educational reform.

Future development directions include: at the technological level, exploring the integration of AIGC with AR/VR and IoT technologies to build a digital twin system for packaging lifecycle management; in education, promoting micro-specialization programs to cultivate more competitive interdisciplinary talents; and in industry, collaborating with regional enterprises to establish an intelligent design industry alliance, setting talent standards, and supporting local industrial upgrading. This study has limitations: the sample size is limited and confined to Liaoning Province, requiring verification of its generalizability; the tracking period is short, and long-term effects need continuous observation. We look forward to more institutions joining the exploration to jointly improve the new design education ecosystem in the AIGC era.

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