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Practical Exploration of Intelligent Teaching Model Empowering the Teaching Reform of Packaging Design Courses in Universities

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ABSTRACT
With the advent of the digital age, the intelligent teaching model, relying on technologies such as big data, artificial intelligence, and virtual reality, has brought new vitality and possibilities to the teaching of packaging design courses. This paper focuses the application of the intelligent teaching model in the teaching reform of packaging design courses in universities, deeply analyzes its core characteristics, based on the application dilemmas, and proposes optimization paths such as constructing an intelligent teaching ecology, expanding the "industry-university-research-application" platform, innovating classroom teaching models, and building production training classrooms around key integration points including technical tools, curriculum content, and teachers' abilities. The research aims to reconstruct a student-centered and industry-demand-oriented teaching system through the systematic integration of the intelligent teaching model, improve students' design innovation and practical application abilities, provide practical references for the teaching reform of packaging design courses in universities, and promote the development of packaging design education towards an interdisciplinary, practical, and innovative direction.

KEYWORDS
Intelligent teaching; Packaging design courses; Teaching reform

1 Introduction

Driven by the wave of digitalization and intelligence, the packaging design industry presents a development trend of greenization, digitalization, and interdisciplinarity, and the demand for compound design talents is increasingly urgent. The traditional packaging design courses in universities have problems such as one-way teaching process, obvious disciplinary barriers, and disconnection between practice and the industry, which are difficult to meet the requirements of industrial development. The intelligent teaching model, with advantages such as technological empowerment and resource integration, provides a new path for curriculum teaching reform.

2 Characteristics of Curriculum Reform Driven by Intelligent Teaching

2.1 Optimizing Teaching Processes to Improve Learning Efficiency

In the traditional teaching of packaging design courses in universities, the teaching process often presents a one-way and linear characteristics, with low information transmission efficiency and limited independent learning space for students. The introduction of the intelligent teaching model has significantly optimized the teaching process of traditional packaging design courses, making "teaching" and "learning" more efficient and precise. In the pre-class stage, teachers release preview materials through the intelligent teaching platform, which automatically tracks learning progress and generates learning situation reports, enabling teachers to accurately identify each student's knowledge base, learning preferences, and weak links. In the in-class teaching stage, intelligent teaching tools break the traditional "cramming" model, construct multi-dimensional interactive scenarios, and provide students with timely feedback and customized guidance. In the post-class stage, the intelligent teaching platform provides students with rich extended learning resources and targeted exercises, forming a closed loop of "learning-practice-feedback".

2.2 Facilitating Disciplinary Integration to Broaden Knowledge Horizons

As a comprehensive discipline, packaging design involves knowledge in multiple fields such as art aesthetics, engineering technology, marketing, and materials science. Following the intelligent and interdisciplinary development trend of the packaging design industry, the intelligent teaching model provides a platform for the interdisciplinary integration of packaging design courses. The intelligent platform aggregates knowledge graphs in multiple fields such as materials science, structural mechanics, and visual communication, creating new scenarios for the cross-integration of packaging design with other disciplines. Students can access cutting-edge design concepts and technical tools, helping them build a systematic knowledge system, master packaging design characteristics under different cultures and backgrounds, effectively break traditional professional barriers, promote students to construct a more systematic and diverse knowledge system, and help them become compound packaging design talents who meet the needs of industrial development.

2.3 Cultivating Core Competencies to Align with Industry Needs

The packaging design industry is in a period of rapid iteration, with greenization, intelligence, and digitalization

becoming mainstream trends. Through technological innovation and teaching reconstruction, the intelligent teaching model has opened up new paths for packaging design education, effectively improving the core competencies and industry adaptability of students majoring in packaging design, promoting closer alignment between education and industry trends, and realizing the synchronous coordination between talent training and industrial needs. In addition, the intelligent teaching platform builds a digital bridge for school-enterprise cooperation, introduces real packaging design projects from enterprises into the classroom, and constructs real design scenarios and tasks. Relying on virtual simulation technology, it highly restores the real workflow of the packaging design industry, helping students keep abreast of cutting-edge trends, effectively improving their practical operation ability and adaptability, and laying a solid foundation for their future career development.

3 Key Points for Integrating Digital Technology into Courses

3.1 Constructing a Technical Tool Ecosystem

The efficient application of digital technology in packaging design teaching is inseparable from the support of suitable technical tools, which are the key bridge connecting teaching goals and practical results. Specifically, it is necessary to build a complete "hardware + software + platform" technical ecosystem: in terms of hardware, equip high-definition drawing screens, 3D printers and other equipment to allow students to intuitively feel the presentation effect of materials and structures; on the software side, introduce professional design software and AI auxiliary tools to realize rapid modeling, color simulation and scheme optimization; at the platform level, build a cloud collaboration system to support teachers and students to share design ideas in real time and modify online annotations, inject intelligent and efficient technical momentum into packaging design teaching, and help students improve design efficiency and innovation ability in practice.

3.2 Optimizing the Curriculum Content System

Curriculum content is the core carrier for achieving teaching goals. In the context of the vigorous development of digital technology, packaging design courses in universities need to build a new curriculum system of "technology empowerment + industry orientation + innovation drive" oriented by industry needs. It is necessary to incorporate new technologies such as AR virtual display, AI-assisted design, and digital simulation of sustainable materials into the curriculum modules, and simultaneously integrate cutting-edge concepts such as green packaging and intelligent interaction. The curriculum setting should balance software operation and creative thinking, not only offering technical courses such as digital modeling and dynamic packaging design but also adding extended content such as cross-border design case analysis and user experience research, so that students can master technical tools while learning to solve practical problems from an industry perspective.

3.3 Improving Teachers' Comprehensive Abilities

In terms of digital technology application, teachers need to proficiently use intelligent tools such as AI design plug-ins and 3D modeling software, and master virtual simulation teaching technology. In terms of interdisciplinary integration, they should have both engineering thinking and data application capabilities, being able to guide students to optimize packaging structures using the principles of material mechanics and insight into design trends with consumer data. In the dimension of teaching innovation, they need to be good at mixed curriculum design, combining online digital resources with offline workshop practice, promoting the implementation of industry-education integration, and cooperating with enterprises to develop real design projects, forming a closed loop between technical tools and teaching goals, and ultimately realizing the substantial improvement of teaching quality through digital technology.

3.4 Innovating the Student Training Model

In the context of the in-depth empowerment of digital technology, the reform of packaging design courses needs to focus on students' ability development and build a new "technology application + innovative thinking + professional literacy" trinity training model. In terms of technology application, through practical training such as AI-assisted design and 3D virtual modeling, students can proficiently master the operation logic and application scenarios of digital tools. The cultivation of innovative thinking should rely on project-based learning, guiding students to use big data to analyze consumer needs and integrate sustainable concepts and intelligent interaction technologies into design schemes. The improvement of professional literacy needs to align with industry standards, and strengthen students' market insight and team cooperation ability through practical training such as simulating brand full-case design and supply chain collaboration.

3.5 Improving the Resource Guarantee System

The effective application of digital technology in packaging design courses in universities relies on the support of a sound resource system, and it is necessary to build a four-in-one guarantee system of "hardware + software + data +

service". In terms of hardware, it is necessary to equip professional facilities such as high-definition graphics workstations, 3D scanning equipment, and intelligent packaging testing instruments, and build an immersive virtual design laboratory. At the software level, introduce genuine design suites, AI auxiliary tools and cloud collaboration platforms to ensure the advanced nature and adaptability of technical tools. Data resources should include material databases, consumer trend analysis reports, classic case libraries, etc., to provide a basis for design decisions. Service support includes technical operation and maintenance teams, industry mentor libraries and school-enterprise cooperation project pools to solve technical problems and practical gaps in teaching.

3.6 Building a Diversified Evaluation System

In the context of intelligent teaching, it is necessary to break the traditional single evaluation model and build a diversified, multi-dimensional and dynamic evaluation system to comprehensively measure the teaching process and students' learning outcomes. The evaluation content should cover knowledge mastery, skill application, innovation ability, professional literacy and other dimensions. The evaluation method needs to integrate process evaluation and summative evaluation: the former dynamically feeds back the learning trajectory through online learning data tracking, classroom design draft iteration, group mutual evaluation records, etc.; the latter comprehensively determines the quality of results by combining design product display, industry mentor review, etc. At the same time, qualitative evaluation is used to supplement quantitative indicators to form a three-dimensional evaluation network, which not only pays attention to the accuracy of technical application but also attaches importance to the depth of thinking innovation, and truly realizes the scientific evaluation of students' comprehensive abilities.

4 Optimization Paths for Curriculum Teaching Reform

4.1 Constructing an Intelligent Teaching Ecology

The intelligent classroom is the core scenario for the implementation of the intelligent teaching model. By integrating digital technology and teaching resources, building a student-centered, interactive and resource-rich learning environment can significantly improve the teaching effect of packaging design courses. In the optimization process, it is necessary to make joint efforts from hardware facilities, software applications, teaching activity design and other aspects. Utilize existing campus networks and information equipment to introduce mature intelligent teaching platforms, such as Chaoxing Xuexitong and Rain Classroom. Build an exclusive space for packaging design courses on the platform, where teachers can upload course materials, assign homework, and conduct online tests; students can check learning content, submit homework, and participate in discussions at any time. At the same time, with the help of the platform's data analysis function, real-time grasp of students' learning progress, homework completion and test scores, providing a basis for personalized teaching. Integrate existing teaching resources, and produce various digital resources from the theoretical knowledge, design cases, design processes and other content in the packaging design courses. Adopt the online and offline mixed teaching model to optimize the teaching process. Before class, teachers release preview tasks through the intelligent teaching platform, such as watching micro-class videos related to packaging design styles and reading classic packaging design case analyses. After completing the preview, students submit preview experiences or questions on the platform. During class, teachers focus on explaining according to students' preview situation and organize activities such as group discussions and case analyses. After class, students complete their homework through the platform, teachers correct online and give timely feedback, and students revise and improve according to the feedback. Invite educational technology experts and excellent teachers to share experiences and analyze cases to improve teachers' information-based teaching abilities. Encourage teachers to carry out teaching research, explore the innovation of teaching methods and evaluation methods of packaging design courses under the intelligent teaching ecology, apply the research results to teaching practice, and continuously improve teaching quality. Through the above measures, the packaging design course can be upgraded from the traditional model of "teacher demonstration - student imitation" to an intelligent ecology of "real projects - AI assistance - market verification".

4.2 Expanding the Industry-University-Research-Application Platform

As a discipline highly dependent on industrial practice, packaging design needs to break the boundaries of traditional classrooms, transform social resources into teaching resources, and build an integrated practical teaching system of "industry-university-research-application". Combining their own teaching and research directions, teachers take the initiative to cooperate with enterprises to carry out small-scale "industry-university-research-application" projects. For example, guiding students to carry out innovative and entrepreneurial projects of packaging design and development of tourist souvenirs based on regional cultural characteristics. Through on-the-spot investigation, cultural element extraction, design and production and other links, students have completed a series of packaging designs of tourist souvenirs with local characteristics and tried to carry out market promotion. Through consultation with enterprises, the design scheme is improved and optimized before being put into production and applied to the actual product packaging

of enterprises. In the process of participating in innovative and entrepreneurial projects, students can cultivate innovative awareness, entrepreneurial spirit and team cooperation ability, and at the same time provide a practical platform for the in-depth integration of "industry-university-research-application". Teachers systematically decompose real enterprise projects into stepped teaching tasks, and students undertake complete project requirements in groups. In the design, they need to simultaneously consider the functionality and sustainability of packaging. Each group starts with in-depth market research, analyzes user preferences combined with consumer data from the intelligent teaching platform, and gradually completes the full-chain design from concept conception to material selection. Throughout the process, teachers and students annotate the details of the scheme in real time through cloud collaboration tools, allowing technical tools to deeply empower design optimization, realize the seamless connection between theoretical learning and industrial practice, and form a closed loop of "design - production - market".

4.3 Innovating Classroom Teaching Models

Under the intelligent teaching model, packaging design courses need to break the traditional teaching thinking, combine market demand with design, and guide students to think about product design from the perspective of consumers. In the classroom, students are encouraged to break conventional thinking, tolerate diverse design schemes, allow trial and error, and guide students to summarize experience from failures. On this basis, with innovation as the core driving force, give full play to the enabling role of digital technology in innovative design. Introduce AI design tools such as Midjourney to assist students in quickly generating creative sketches. For example, cooperate with food enterprises to let students design packaging for newly launched snack products. In the process of project implementation, teachers are not one-way transmitters of knowledge, but mentors who guide students to use the knowledge they have learned to solve practical problems. Students need to independently analyze the preferences of target consumer groups and the packaging characteristics of competitors, and carry out innovative designs on this basis.

4.4 Building Production Training Classrooms

The ultimate value of packaging design is reflected in production practice. The establishment of production classrooms aims to break the barrier between teaching and production. By simulating real production processes, integrating industrial resources, and strengthening school-enterprise cooperation, students can master the full-chain knowledge and skills from design schemes to finished product output in practice, realizing the ability leap from design works to market products. Firstly, use virtual simulation technology and on-campus training equipment to build a highly restored simulated packaging production environment, focusing on strengthening safety production education and quality management awareness training. Secondly, establish in-depth cooperation with packaging production enterprises to carry out joint training projects, such as the design of packaging production efficiency improvement schemes and the application testing of new packaging materials, allowing students to deepen their understanding and application of professional knowledge by solving practical problems. Thirdly, integrate the resource advantages of schools and enterprises to build an industry-education integration resource library, strengthening students' engineering practice ability, project management ability and market transformation ability. Finally, in the teaching of production classrooms, pay attention to cultivating students' quality awareness and cost control ability.

5 Conclusions and Prospects

In summary, taking packaging design courses as the practical carrier, through the systematic integration of the intelligent teaching model, this paper explores the paths and methods of teaching reform, reconstructs a student-centered and industry-demand-oriented teaching system, leads the development of packaging design education towards a more practical, interdisciplinary and innovative direction, significantly improves students' design innovation ability and practical application level, shortens the distance from classroom learning to professional practice, and provides strong support for teachers to optimize teaching strategies and realize precise guidance. Looking forward to the future, with the rapid iteration of new technologies such as generative artificial intelligence, the intelligent teaching reform of packaging design courses in universities will usher in a broader development space, providing strong support for cultivating more outstanding packaging design talents and promoting the sustainable and healthy development of the design industry.

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