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Research on the Teaching Reform of Product Design Courses in Universities Under the Background of Artificial Intelligence

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Abstract: Against the backdrop of the rapid development of artificial intelligence technology, the product design industry has ushered in an intelligent transformation, putting forward new requirements for the ability structure of design talents. As the core position for cultivating product design talents, universities' traditional curriculum teaching models can no longer adapt to the needs of industry development. Based on this, this paper conducts research on the teaching reform of product design courses in universities under the background of artificial intelligence, analyzes the existing problems in the teaching of product design courses in universities, expounds the important value of carrying out teaching reform under the background of artificial intelligence, and proposes corresponding reform countermeasures. It aims to provide theoretical reference and practical paths for universities to cultivate product design professionals who meet the requirements of the intelligent era.

Keywords: Artificial intelligence; Universities; Product design; Teaching reform; Talent cultivation

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1. Introduction

With the breakthrough of artificial intelligence technologies such as ChatGPT, the production models and development logic of various industries have undergone profound changes, and the product design industry is no exception. Relying on the advantages of data mining, intelligent modeling, and rapid iteration, artificial intelligence technology can effectively optimize the design process, expand the creative boundary, and promote the transformation of product design from "experience-driven" to "data-driven". In this context, the market demand for product design talents has exceeded the scope of traditional design aesthetics and hand-drawing abilities, and more emphasizes comprehensive abilities such as artificial intelligence technology application and interdisciplinary collaborative innovation [1]. As the main channel for cultivating product design talents, universities' curriculum teaching systems directly determine the quality of talent cultivation. Therefore, exploring feasible countermeasures is of great significance.

2. Existing problems in the teaching of product design courses in universities

2.1. Outdated teaching content, disconnected from industry development needs

Teaching content is the core carrier of talent cultivation, and its scientificity and timeliness directly affect the cultivation quality. Currently, the content of product design courses in most universities lags behind the intelligent development of the industry, still focusing on the teaching of traditional design theories and skills, such as hand-drawing expression, material technology, and traditional modeling software operation. There is insufficient involvement in cutting-edge content such as intelligent product interaction logic design, big data user demand analysis, and AI-assisted design tool application [2]. At the same time, most teaching cases are traditional industrial product design cases, lacking the analysis of intelligent product design cases, resulting in students' lack of cognition of cutting-edge industry concepts and processes.

2.2. Insufficient integration of Artificial Intelligence technology

Artificial intelligence technology is an important driving force for innovating teaching models, but its integration effect in current university product design courses is not ideal, and the problem of rigid teaching models is prominent. In the teaching process, most teachers still adopt the traditional model of "theoretical teaching + case analysis + practical exercise", with teachers as the center, and students passively accept knowledge, lacking opportunities for active exploration and innovative practice; artificial intelligence technology is only simply used as a basic modeling tool in a few courses, failing to give full play to core advantages such as data mining, intelligent creative generation, and personalized teaching [3]. In terms of practical teaching, most are simulated design projects, lacking connection with real intelligent product design projects of enterprises, making it difficult for students to master the application methods of AI technology in the entire design process. In addition, some universities lack professional AI teaching equipment and platforms, and teachers' cognitive and application abilities of AI technology are limited, which further restricts the in-depth integration of technology.

2.3. Single teaching evaluation standard

Teaching evaluation plays an important guiding role in the teaching direction. The current single evaluation standard of product design courses in universities is difficult to adapt to the demand for comprehensive ability cultivation in the artificial intelligence era. In terms of evaluation subjects, teacher evaluation is the main focus, lacking students' self-evaluation, mutual evaluation, and the participation of enterprise and industry experts, making it difficult for the evaluation results to fully reflect students' real learning effects and comprehensive abilities [4]. In terms of evaluation content, it focuses on the completion degree of design works and the mastery of theoretical knowledge, ignoring the assessment of key abilities such as AI technology application ability, innovative thinking, and teamwork ability. This single evaluation standard can neither accurately measure students' comprehensive literacy nor restrict students' personalized development and innovative ability improvement, which is not conducive to cultivating intelligent product design talents needed by the industry.

3. Important value of teaching reform of product design courses in universities under the background of Artificial Intelligence

3.1. Conducive to enhancing students' employment competitiveness

With the deepening of the intelligent transformation of the product design industry, the market demand for design talents with AI technology application capabilities is increasing. Carrying out teaching reform and

integrating artificial intelligence-related knowledge and skills into the curriculum system can enable students to master cutting-edge industry technologies and concepts. While consolidating traditional design skills, they can proficiently use AI-assisted tools to complete market research, creative generation, prototype production, and other work, and possess core intelligent product design capabilities [5]. This can not only make up for the gap between talent cultivation and industry demand but also significantly improve students' employment competitiveness, and transport high-quality intelligent design talents for the industry, helping the industry's transformation and development.

3.2. Conducive to improving classroom teaching quality

Artificial intelligence technology provides new possibilities for the innovation of teaching methods and means. Carrying out teaching reform can prompt teachers to break through the constraints of traditional models, give full play to the optimization effect of AI technology on the teaching process, mine students' learning behaviors and needs through big data analysis, formulate personalized learning plans, and carry out interactive teaching relying on AI-assisted design tools to improve students' enthusiasm for practical exploration [6]. The new methods can well mobilize students' learning interest, improve their initiative, enhance classroom teaching quality, and promote the modern transformation of teaching models.

3.3. Conducive to cultivating students' innovative thinking

Innovation is the core of product design and the key driving force for the high-quality development of the design industry. Artificial intelligence technology provides new creative ideas and methods for product design, and teaching reform conveys this innovative concept to students [7]. After the reform, curriculum teaching will focus on the cultivation of innovative thinking and interdisciplinary collaborative capabilities, guiding students to use AI technology to break through the constraints of traditional design thinking and carry out diversified innovative design practices. Students can use AI technology to quickly generate and optimize many design schemes to improve their innovative abilities.

4. Countermeasures for the teaching reform of product design courses in universities under the background of Artificial Intelligence

4.1. Introduce Artificial Intelligence application cases and innovate curriculum teaching content

Teaching content is the foundation of teaching work. Teachers should focus on the development needs of artificial intelligence, introduce artificial intelligence technology application cases, and optimize the teaching content of product design courses.

(1) Reasonably adjust the curriculum system structure. Based on retaining traditional core knowledge and skills, teachers can add some artificial intelligence curriculum modules, such as AI-assisted product design and intelligent product interaction design, explain the application of artificial intelligence technology in product design, and cultivate students' artificial intelligence application skills. Teachers can also introduce artificial intelligence tools into various related courses, such as teaching students to use Midjourney for creative generation and Figma with AI plug-ins for interface design, to improve students' practical operation abilities [8].

(2) Collect the latest intelligent product design cases in the industry, such as smart home appliances, smart

wearable devices, and smart homes, and integrate them into classroom teaching. Through the analysis of cases, students can have a deeper understanding of the design concepts, technology applications, and user demand satisfaction of intelligent products, thereby feeling the cutting-edge trends of the industry and improving their understanding of intelligent design. Universities should also strengthen cooperation with enterprises, invite enterprise experts to participate in the formulation and updating of curriculum content, and ensure the scientificity, timeliness, and practicality of teaching content.

(3) Design a dynamic update mechanism. Teachers should continuously update the case database using AI technology, collect more achievements in the global intelligent product design field, understand breakthrough cases of advanced technologies, and introduce them into the case database after screening and sorting to provide students with more cutting-edge teaching resources. Teachers can also encourage students to participate in internships in enterprise intelligent product design, and bring real cases encountered and learned during internships to the classroom, which can enhance the appeal of teaching content and allow students to more accurately understand the industry development situation.

4.2. Give play to the advantages of Artificial Intelligence technology and innovate teaching methods and means

Universities should fully leverage the advantages of artificial intelligence technology, break through the constraints of traditional teaching models, and innovate the teaching methods and means of product design courses.

(1) Create a personalized teaching model. Use big data analysis technology to collect students' learning data, such as learning progress, knowledge mastery, and learning interest preferences, analyze the data using AI algorithms to accurately identify students' learning needs and weak links, and formulate personalized learning plans for students. Students with poor foundations are pushed to basic theory and skill training resources; students with insufficient innovation ability are pushed to creative design cases and practical projects [9].

(2) Carry out interactive practical teaching. Build a virtual simulation practical teaching environment with the help of AI-assisted design platforms and equipment, allowing students to carry out product design practice in a virtual environment. Students can use AI technology to quickly build product models, simulate and optimize their performance, and use virtual interaction to test whether the design is reasonable. At the same time, introduce real intelligent product design projects of enterprises, organize students to participate in project design in teams, master the application methods of artificial intelligence technology in real project practice, and improve teamwork ability and problem-solving ability [10].

(3) Create an online-offline integrated teaching platform. The online platform provides students with flexible learning channels relying on MOOCs, micro-courses and other resources, allowing students to learn artificial intelligence-related knowledge and skills anytime and anywhere. The offline classroom mainly carries out teaching activities such as practical operations, case discussions, and group cooperation, organically combining online knowledge learning with offline practical application to improve teaching efficiency and quality.

(4) Use AI tools to inspire students' creativity. Teachers can use AI technology to inspire students and let them learn to use AI tools. Teachers can first provide students with some product design cases constructed by AI, push suitable cutting-edge design works, decompose the design logic and technical application points through algorithms, and use AI tools for demand analysis and data visualization

analysis. Then guide students to create using AI technology, input design requirements and core parameters to generate diversified creative solutions for secondary creation, break through thinking limitations, and help students quickly understand core knowledge. In actual design, students can use AI real-time collaboration tools for design research and creative collision, while teachers provide intervention and guidance to exercise students' comprehensive skills and improve teaching effectiveness.

4.3. Strengthen the construction of teachers' teams and improve teachers' digital intelligence capabilities

Teachers are the implementers of teaching reform, and their digital intelligence capabilities directly determine the effect of integrating artificial intelligence technology into curriculum teaching. Therefore, universities should strengthen the construction of product design professional teachers' teams and comprehensively improve teachers' artificial intelligence application capabilities and teaching levels.

(1) Carry out targeted teacher training. Regularly organize teachers to participate in training courses, seminars, workshops, and other activities related to the integration of artificial intelligence technology and product design, invite industry experts and backbone professionals to give lectures, and systematically impart the use methods of AI-assisted design tools and the application skills of artificial intelligence technology in teaching. At the same time, encourage teachers to independently learn artificial intelligence-related knowledge and improve their digital intelligence literacy through online courses, professional books, and other channels [11].

(2) Build teacher exchange and practice platforms. Organize teachers to take temporary positions or visit and study in artificial intelligence enterprises and excellent design companies to understand cutting-edge industry technologies and design concepts and accumulate practical experience. At the same time, establish an exchange and cooperation mechanism among teachers to promote teachers to carry out teaching research and project research related to the integration of artificial intelligence and teaching, exchange teaching experience and achievements, and jointly improve teaching levels.

(3) Introduce high-level digital intelligence talents. Universities should formulate preferential policies to introduce compound talents with an artificial intelligence technology background and product design experience to enrich the teachers' team. Adopt the method of "introduction and training combination" to cultivate a high-quality teachers' team that masters both product design and artificial intelligence technology, providing talent guarantee for the smooth progress of teaching reform [12].

4.4. Update teaching evaluation standards and help students' cognitive renewal

Universities should break the traditional single evaluation model, establish a scientific and reasonable diversified evaluation system, give play to the guiding role of evaluation, and promote the improvement of students' cognitive renewal and comprehensive abilities. On the one hand, expand the evaluation subjects, establish a diversified evaluation system including teacher evaluation, student self-evaluation, student mutual evaluation, and enterprise evaluation, and comprehensively and objectively reflect students' learning effects and comprehensive abilities by integrating evaluation opinions from all parties. Teacher evaluation focuses on students' learning attitude, mastery of theoretical knowledge, and practical operation ability; student self-evaluation and mutual evaluation focus on self-reflection and mutual learning, improving students' autonomous learning ability and critical thinking; enterprise evaluation pays attention to students' project practice ability, teamwork ability, and post adaptability, ensuring that the evaluation results are consistent with industry needs [13]. On the other hand,

improve the evaluation content and methods. The evaluation content should not only include the traditional completion degree of works and theoretical knowledge assessment, but also highlight the addition of assessment indicators for important abilities such as artificial intelligence technology application ability, innovative thinking, and teamwork ability. The evaluation method should adopt a combination of process evaluation and summative evaluation. Process evaluation focuses on students' classroom participation, practical operation progress, group collaboration contributions, etc., displayed in the learning process; summative evaluation is carried out in the form of design works, project reports, and skill assessments to comprehensively assess students' comprehensive abilities [14]. In addition, use artificial intelligence evaluation tools to objectively analyze students' learning processes and achievements, improve the scientificity and accuracy of evaluation, guide students to establish correct learning goals, and actively improve their digital intelligence literacy and comprehensive abilities [15].

5. Conclusion

In summary, the rapid development of artificial intelligence technology has brought unprecedented development opportunities to the product design industry, and also put forward new challenges for the cultivation of product design professionals in universities. In this context, universities should carry out teaching reform work, timely innovate curriculum teaching content, innovate teaching methods and means, strengthen the construction of teachers' teams, and update teaching evaluation standards, which can improve the quality of talent cultivation and enhance students' employment competitiveness. In subsequent work, schools should continue to promote teaching reform, continuously optimize teaching content, and cultivate more high-quality product design talents.

Disclosure statement

The author declares no conflict of interest.

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