Innovation of Graduate Training Mode for Industrial Design Engineering Based on the Industry-academic Integration

Ji Li

School of Art and Design, Dalian Jiaotong University, Dalian, China

Keywords: Industry-academic integration; Industrial design engineering; Postgraduate training mode; Practical ability; Creative thinking

Abstract: The purpose of this article is to explore the innovative path of industrial design engineering graduate training mode based on the industry-academic integration, in order to meet the challenge of the current education system in cultivating high-quality and innovative industrial design engineering talents. In terms of methods, this article adopts a combination of status quo analysis and model innovation. First of all, the present situation and challenges of the graduate education system of industrial design engineering are deeply analyzed, and the problems existing in the current education system are pointed out. Then, through the practical exploration of the industry-academic integration, this article puts forward an innovative scheme of the postgraduate training mode of industrial design engineering based on the industry-academic integration, including the construction principles, objectives and specific contents. The results show that the postgraduate training mode of industrial design engineering based on the industry-academic integration can effectively improve students' practical ability and innovative thinking, and better meet the needs of the industry. At the same time, this article also puts forward a series of implementation strategies and safeguard measures to ensure the smooth implementation of this model.

1. Introduction

Under the background of today's rapid development, the field of industrial design engineering is facing unprecedented opportunities and challenges [1]. With the continuous progress of technology and the diversified demand of the market, the demand for industrial design engineering talents is also growing, especially for high-quality graduate students with innovative thinking and practical ability [2]. However, there are still many shortcomings in the current education system in cultivating such talents, such as the disconnection between theory and practice and the lack of innovative ability training [3]. Therefore, it is of great significance to explore a training mode of industrial design engineering graduate students based on the industry-academic integration for improving the comprehensive quality and innovation ability of graduate students and promoting the sustainable development of industrial design engineering.

As a new educational model, the industry-academic integration emphasizes the close combination of education and industry, aiming at guiding the reform of educational content and methods through the actual needs and feedback of industry [4]. In the field of industrial design engineering, the concept of industry-academic integration has been gradually recognized and popularized [5]. By combing the relevant literature, we can find that scholars have done a lot of research and practice on the industry-academic integration, and put forward many useful theories and viewpoints. These theories and viewpoints provide an important theoretical basis and reference for us to explore the postgraduate training mode of industrial design engineering based on the industry-academic integration.

2. Analysis on the current situation of postgraduate education in industrial design engineering

2.1. The status quo and challenges of the education system

At present, there are still many problems in the postgraduate education system of industrial design engineering in terms of curriculum, teaching methods and evaluation mechanism [6]. On the one hand, the curriculum pays too much attention to the teaching of theoretical knowledge, but lacks the close combination with practice, which leads to students' inability to solve practical problems [7]. On the other hand, the teaching method is single and lacks innovation and interaction, which makes it difficult to stimulate students' interest and creativity in learning. The evaluation mechanism also pays too much attention to academic achievements and ignores the evaluation of students' practical ability and innovation ability, thus affecting students' all-round development.

2.2. Practical exploration of the industry-academic integration

Facing the challenge of the education system, some universities and enterprises began to try the practical exploration of the industry-academic integration [8]. They integrate the actual needs of the industry into the education process through school-enterprise cooperation and work-study combination, so that students can also get in touch with real engineering projects and product design while studying [9]. This kind of practical exploration not only improves students' practical ability and innovation ability, but also provides more excellent talent resources for enterprises. However, the practice of the industry-academic integration still faces many difficulties and challenges (as shown in Table 1), which need to be further explored and solved in future research.

Table 1 Difficulties and Challenges in the Practice of Industry-Education Integration

Difficulties and Challenges	Specific Descriptions
Disconnection between Educational Concepts and Industry Needs	Traditional educational systems struggle to quickly adapt to rapidly changing industry needs; there is a gap between teaching content and practical applications.
Inadequate Industry-School Cooperation Mechanisms	Lack of effective cooperation platforms and mechanisms, resulting in low cooperation efficiency; unclear distribution of rights and interests between cooperating parties, affecting enthusiasm for collaboration.
Insufficient and Imbalanced Faculty Resources	Teachers lack practical experience, making it difficult to meet the teaching needs of industry-education integration; the proportion of teachers with industrial backgrounds in the faculty is low.
Insufficient Funding and Uneven Resource Allocation	Industry-education integration projects require substantial funding, but funding sources are limited; resources are unevenly distributed among different universities and enterprises, affecting overall progress.
Incomplete Student Practice and Innovation Cultivation System	Practice sessions are not well-designed, lacking systematicness and specificity; the innovation cultivation mechanism is not well-established, making it difficult to stimulate students' innovative potential.
Low Enterprise Participation and Insufficient Enthusiasm	Enterprises have insufficient understanding of industry-education integration and lack enthusiasm for participation; during cooperation, the benefits to enterprises are not obvious, affecting their motivation for continued involvement.
Inadequate Policy Support and Legal Regulations	Relevant policies are lacking or not effectively implemented, making it difficult to effectively promote industry-education integration; the legal and regulatory system is not well-established, posing legal risks during cooperation.
Incomplete Evaluation and Feedback Mechanisms	There is a lack of a scientific evaluation system, making it difficult to accurately measure the effects of industry-education integration; the feedback mechanism is not smooth, making it difficult to timely adjust and optimize cooperation plans.

3. Innovation of postgraduate training mode of industrial design engineering based on the industry-academic integration

3.1. Construction principles and objectives of innovation model

When constructing the postgraduate training mode of industrial design engineering based on the industry-academic integration, this article follows the principles of collaboration, practicality and innovation. Synergy emphasizes the close cooperation between educational institutions and industry to jointly formulate training programs and teaching plans. Practicality pays attention to the combination of theoretical knowledge and practice, and cultivates students' practical ability and innovation ability through the design and implementation of practical projects. Innovation requires us to constantly explore and innovate in the training mode to adapt to the development of the times and the changes in demand. The goal of this article is to cultivate industrial design engineering graduate students with solid theoretical foundation, strong practical ability and innovative thinking, and provide strong talent support for the development of industrial design engineering.

3.2. The specific content of the innovation model

As for the specific content of innovation mode, this article makes a comprehensive analysis and planning from four core dimensions: curriculum system, teaching mode, evaluation system and resource sharing platform.

Aiming at the reconstruction of curriculum system, this article is not only satisfied with the status quo, but focuses on the integration of future education and industry needs. On the basis of retaining the essence of traditional theoretical courses, we boldly introduced more practice-oriented courses. Its purpose is to enable students to experience the application process of knowledge while mastering solid theories. The addition of interdisciplinary course is a bright spot, which breaks down the barriers between disciplines and encourages students to learn across disciplines, thus cultivating industrial design engineering talents with broad vision and compound knowledge structure. This curriculum system design provides a solid foundation for students to closely combine theoretical knowledge with practical operation.

The reform of teaching mode is a key link to improve the quality of education. This article abandons the teaching mode of single lecture and adopts more flexible and diverse teaching methods such as project-driven and work-integrated learning. Project-driven enables students to study around specific tasks, which not only stimulates their interest in learning, but also exercises their ability to solve practical problems. Work-study combination, through cooperation with enterprises, allows students to study in real working environment and directly participate in product design, research and development, which greatly enhances their practical experience and teamwork ability.

In the aspect of evaluation system, this article constructs a diversified evaluation mechanism, which no longer only depends on the test scores, but pays more attention to the comprehensive evaluation of students' practical ability and innovation ability. This includes many dimensions, such as project completion, innovative scheme design and teamwork performance, aiming at comprehensively reflecting students' true level and potential and providing more accurate guidance for their personalized development.

In order to promote the effective connection between education chain, talent chain, industrial chain and innovation chain, this article actively builds a platform for school-enterprise resource sharing. This platform not only promotes the free flow and efficient sharing of key resources such as information, technology and talents, but also builds a bridge of close cooperation between enterprises and schools, providing strong support for the industry-academic integration. Through this platform, students can get in touch with the latest technology and industry trends, and enterprises can directly participate in the process of talent training to achieve a win-win situation.

4. Implementation strategy and safeguard measures

4.1. Implementation strategy

In order to effectively promote the implementation of the postgraduate training mode of industrial design engineering based on the industry-academic integration, this article has formulated a series of specific and feasible strategies. First of all, this article believes that we should deepen the cooperation between schools and enterprises, establish a stable cooperative relationship, and jointly formulate training objectives and teaching plans to ensure that the educational content is closely connected with the needs of the industry. Secondly, universities should optimize the curriculum, increase the content of practical and innovative courses, and introduce enterprise experts to participate in teaching, so as to enhance students' practical ability and innovative thinking. In addition, universities should also strengthen the construction of teaching staff, improve teachers' practical experience and teaching ability, and provide better guidance for students. Through the implementation of these strategies, this article has gradually built an efficient and practical training system for the industry-academic integration.

4.2. Safeguard measures

In order to ensure the smooth implementation of the postgraduate training mode of industrial design engineering based on the industry-academic integration, this article also takes a series of safeguard measures, as shown in Table 2.

Table 2 Safeguard Measures for the Implementation of Industry-Education Integration-Based Graduate Training Model in Industrial Design Engineering

Safeguard Measures	Specific Contents
Establish a Sound Management Mechanism	Clarify the responsibilities and rights of schools, enterprises, governments, and other parties in industry-education integration
	Set up a dedicated management agency or coordination group responsible for the planning, execution, and supervision of cooperation projects
	Formulate cooperation norms and processes to ensure transparency and standardization of the cooperation process
Increase Funding and Encourage Enterprise Participation	Increase special funding support from governments and schools for industry-education integration projects
	Establish an industry-school cooperation fund to encourage enterprises to invest in education and share development achievements
	Provide tax reductions, subsidies, and other preferential policies to motivate enterprise participation
Strengthen Quality Supervision and Evaluation	Establish a regular evaluation mechanism for comprehensive and objective assessments of training effectiveness
	Introduce third-party evaluation agencies to ensure fairness and professionalism in evaluations
	Adjust training programs and teaching plans based on evaluation results to continuously optimize the teaching system
	Establish a feedback mechanism to timely collect opinions from students, teachers, enterprises, and other stakeholders for continuous improvement

Table 2 shows a series of safeguard measures taken to ensure the smooth implementation of the postgraduate training mode of industrial design engineering based on the industry-academic integration. These include establishing a sound management mechanism, increasing capital investment and encouraging enterprises to participate in education investment, and strengthening quality supervision and evaluation. The implementation of these safeguards will provide strong support for the in-depth development of the industry-academic integration.

5. Conclusions

Through research, this article deeply understands the importance and innovation of the

postgraduate training mode of industrial design engineering based on the industry-academic integration. This training mode not only helps to improve students' practical ability and innovative thinking, but also better meets the demand of industry for high-quality talents. At the same time, this article also believes that there are still some challenges and problems in the implementation process, which need further discussion and solution in future research.

Looking forward to the future, we will continue to pay attention to the development trend of the industry-academic integration, and deeply study the problems and countermeasures in its practical application. Future research directions include how to further optimize the curriculum system, improve the teaching quality, strengthen the construction of teachers and improve the management mechanism. At the same time, we will also actively respond to possible challenges, such as imperfect cooperation mechanism and uneven distribution of resources, and strive to contribute to the sustainable development of the postgraduate training model of industrial design engineering based on the industry-academic integration.

Acknowledgements

Research Project on the Reform of Graduate Education and Teaching in Liaoning Province in 2024, entitled "Innovative Research and Practice of Industrial Design Engineering Graduate Training Mode Based on Industry Education Integration" (Project Number: LNYJG2024134)

References

[1] Xiang Zerui, Zhi Jinyi, Xu Bochu. Research on the training mode of industrial design graduate students with the characteristics of rail transit industry-taking Southwest Jiaotong University as an example [J]. Journal of Southwest Jiaotong University (Social Science Edition), 2019, 20(03):107-116.

[2] Chen Yibing, Zheng Silu, Tang Xiaoying. Research on walker development from the perspective of inclusive design process [J]. Packaging Engineering, 2022, 43(24):167-179+188.

[3] Yi Jun, Yan Hu. Research on the construction scheme of design knowledge base for construction machinery industry [J]. Packaging Engineering, 2020,41(18):71-77.

[4] Ma Sai. System Reconstruction and Innovation in Industrial Design [J]. Packaging Engineering, 2018, 039(022):8-11.

[5] Chen Jian, Mo Rong, Chu Jianjie, et al. Modular reorganization and distribution method of collaborative tasks for industrial design cloud service platform [J]. Computer Integrated Manufacturing System, 2018,24(03):720-730.

[6] Li Xiaoying, Zhou Datao. Visualization method of product design requirement information for intelligent manufacturing service [J]. China Mechanical Engineering, 2020,31(07):871-881.

[7] Fan Jiashuang, Yu Suihuai, Chu Jianjie, et al. Optimization decision of design team members based on user preferences under the industrial design cloud service platform [J]. Computer Integrated Manufacturing System, 2019,25(11):2863-2873.

[8] Tan Hao, Li Wei, Han Lihong. Research on Generative Thinking of User Participatory Industrial Design [J]. Packaging Engineering, 2018,39(24):146-151.

[9] Liu Zishi, Ma Haitao. Practice and thinking of innovative sports talents training mode under the background of industry-academic integration [J]. Journal of Beijing Sport University, 2023, 46(10):73-79.