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Research on the Talent Cultivation Model for Emerging Engineering Disciplines in Local Universities under the Context of Industry-Education Integration

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Abstract: *In the context of the digital economy empowering the transformation and upgrading of traditional manufacturing industries, the support of talents in emerging disciplines is crucial. As universities serve as the main battleground for regional industrial and economic development, they have an obligation to undertake the task of cultivating these talents. Achieving in-depth and efficient integration of industry and education has become an urgent issue for applied undergraduate universities.This paper conducts an in-depth analysis of the current practice of industry-education integration in applied undergraduate universities and proposes a series of innovative strategies. These strategies include adjusting the curriculum system based on industry demands, enhancing the professional development of faculty, and collaborating with enterprises to build practical teaching platforms. The aim of these strategies is to establish a new model of industry-education integration for talent cultivation, with the expectation of significantly improving the effectiveness of applied talent cultivation in local universities.*

Keywords: *Emerging Talents in New Engineering Disciplines, Industry-education Integration, University-enterprise Collaboration, Talent Cultivation*

1. Introduction

In recent years, China has placed high emphasis on higher education and talent cultivation, particularly highlighting the implementation of the industry-education integration education model to tap into the potential of university faculty and students, in order to promote the transformation and upgrading of local industrial economy. Local higher education institutions, as bases for cultivating innovative, professional, and applied talents, are improving the teaching and talent cultivation methods in the field of robotics engineering to achieve this goal. Currently, universities bear the important mission of nurturing high-quality, multi-skilled, and innovative talents who can adapt to and lead the trends in the robotics industry. This is not only a key task in the field of higher education but also a core goal it pursues[1].

Guided by the Ministry of Education's guidelines on the construction of modern industrial colleges and national policies on deepening industry-education integration, this paper aims to explore and construct a talent cultivation model that meets the needs of the times. With a focus on the demand for talents in the intelligent robotics industry and the goal of revitalizing Longjiang's industry and accelerating the high-quality development of the intelligent robotics industry, the paper aims to build a practical platform for university-enterprise cooperation based on the characteristics of applied undergraduate education. Guided by the concept of engineering education, it will implement in-depth industry-education integration talent cultivation strategies to serve the transformation and upgrading of the industry[1]. The paper will explore more closely and effective cooperation models with enterprises to promote the deep integration of education and industry, jointly cultivating high-quality talents that meet the future needs of industrial development[2].

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2. The Problems Faced by the Integration of Production and Education in Local Universities

Local universities face challenges and issues in the cultivation of talents in new engineering disciplines and meeting the requirements of new engineering construction. According to the guidelines for the construction of modern industrial colleges issued by the Ministry of Education and national policies on deepening industry-education integration, local universities have taken a series of measures, including revising talent cultivation plans and carrying out curriculum reforms[3]. However, these efforts may not be sufficient to fully meet the requirements of new engineering construction, and the problems that exist may include:

2.1. Insufficient depth in the "two-way" collaboration between universities and enterprises:

In the process of jointly establishing practical platforms through university-enterprise cooperation, both universities and enterprises lack in-depth integration in industry-education integration. This collaboration often remains superficial and does not bring substantial benefits to both parties. Issues such as inadequate support from enterprises for curriculum development and teaching reforms in new engineering colleges and universities, and universities being in the early stage of exploring and improving modern industry-education integration methods, are prevalent.

2.2. Lack of industrial experience in the faculty

The faculty faces challenges in adapting to the demands of emerging industries, primarily due to insufficient sensitivity to emerging technologies, weak practical skills, and limited funding and resources[4]. These issues lead to a disconnect between talent cultivation goals and emerging industries. The lack of practical teaching experience among young teachers, excessive emphasis on theoretical knowledge, and the neglect of engineering practical skills make it difficult to closely integrate educational content with new industries and technologies, and fail to fully meet the diversified abilities required by new engineering disciplines[5-6]. Additionally, influenced by traditional education models, many teachers still prioritize theoretical research in teaching, neglecting the cultivation of engineering practical skills. This limits students' practical opportunities in emerging technology fields and hinders their ability to keep up with the rapid pace of technological advancements. Effective measures must be taken to enhance teachers' practical teaching abilities, promote the close integration of teaching content with industry demands, and cultivate high-quality engineering and technical talents capable of meeting the requirements of the new era.

2.3. Disconnect between curriculum content and industry demands

With the rapid development of new technologies and industries, the curriculum system of universities often struggles to be updated in a timely manner, resulting in a gap between teaching content and actual industry demands. Universities need to be able to adjust their curriculum offerings promptly, introducing courses that are relevant to emerging industries such as artificial intelligence, big data, and cloud computing.

2.4. Insufficient practical teaching resources

New engineering disciplines typically require abundant practical teaching resources, but local universities often have limited investments in this area. Therefore, local universities urgently need to increase their investments in funds and resources, establish more laboratories and training bases to provide students with a wider range of practical opportunities. This not only helps enhance students' hands-on abilities and practical skills but also better meets the high requirements of practical teaching for the cultivation of talents in new engineering disciplines.

3. Talent Training and Industrial Transformation and upgrading of new Engineering in Local Colleges and Universities

3.1. Current Status of Regional Industrial Transformation

The 2021 China Enterprise Digital Transformation Index Research Report by the National Industrial Information Security Development Research Center indicates that the overall digitalization level of

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Chinese enterprises is steadily advancing[7]. Under the empowerment of the digital economy, it is increasingly challenging for traditional manufacturing enterprises in the old industrial base of Northeast China to maintain their original competitive advantages. Therefore, it is essential to leverage digital technologies to modernize the industrial and supply chains, genuinely enhancing economic quality, efficiency, and core competitiveness. The province has proposed the vigorous implementation of the "Hundred, Thousand, Ten Thousand" project, aiming to cultivate a batch of intelligent, digital, and information-based enterprises worth billions. This initiative supports the transformation of the manufacturing industry towards new engineering disciplines by introducing intelligent production equipment and building smart factories, thereby addressing issues such as high labor costs, low efficiency, and unstable product quality, and promoting high-quality economic development in the manufacturing sector. During the industrial transformation, the rapid application of new-generation information technologies such as artificial intelligence and the Internet of Things in the industrial field has facilitated the digital and intelligent development of electromechanical equipment products. Consequently, the demand for new engineering discipline professionals is increasing, making the cultivation of such talents particularly crucial in the process of industrial transformation.

3.2. Development of Industry-Education Integration in New Engineering Discipline Talent Cultivation in Local Universities

In recent years, through the exploration of school-enterprise joint construction platforms, resource allocation sharing, and the establishment of interdisciplinary projects, local universities in Heilongjiang have achieved certain results in industry-education integration. Collaborations with industries and enterprises to jointly establish collaborative innovation centers and specialized colleges have positively impacted local economic and industrial development. However, with the rapid advancement of industrial transformation, local universities still face challenges in optimizing the structure of disciplines, levels, and quality. Driven by digital transformation, industrial upgrading has created an urgent demand for high-level talents and resources, especially high-end technical and interdisciplinary talents, who are currently in short supply. Therefore, to revitalize Heilongjiang's industry and accelerate the high-quality development of the intelligent robotics industry, there is a need to focus on regional development, enterprise growth, the transformation and upgrading of traditional manufacturing, and the enhancement of regional economic and social value[8].

4. Pathways for Constructing Industry-Education Integrated Talent Cultivation Models in New Engineering Disciplines

In the multidimensional construction of talent cultivation in new engineering disciplines, deepening the industry-education integration model is crucial for nurturing versatile talents that meet enterprise needs. This model emphasizes close alignment with partner enterprises to address their specific requirements in R&D, assembly, technological innovation, process improvement, and after-sales service. Therefore, educators must comprehensively consider various aspects such as the design of talent cultivation programs, the construction of curriculum systems, and the effectiveness of experimental training to achieve multidimensional talent development.

4.1. Talent Cultivation Programs Aligned with Local Economic Needs

To address the issue where traditional universal education cannot meet the talent demands brought by rapid industrial development, universities must engage deeply with industries as the talent cultivation end. For new engineering disciplines, talent cultivation should actively serve local economic development needs, following the basic laws of talent growth and scientifically determining the direction of talent cultivation. Additionally, universities and enterprises should jointly streamline the talent selection process, ensuring that graduates are directly channeled into enterprises.

For example, the "Robotics Engineering Talent Cultivation Program" at Jiamusi University aims to develop high-quality, application-oriented talents with strong comprehensive professional abilities. These talents should be capable of adapting to regional economic development, proficiently using modern design and simulation tools, and engaging in roles such as designing, installing, and debugging robotic workstations, integrating robotic systems, and managing robotic automation production lines. This approach highlights the service to industry and local economy, addressing the demand for practical talents while also meeting students' employment needs, ensuring employment upon graduation.

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4.2. Professional Courses Aligned with Industry Needs

In constructing the application-oriented talent cultivation model for new engineering disciplines, the School of Information and Electronic Technology has optimized existing courses based on the requirements for practical innovation abilities that new engineering students should achieve, considering the industrial transformation and regional economic development in Northeast China. The focus of curriculum reform is on practical teaching, aiming to cultivate students' hands-on and innovative abilities, thereby comprehensively enhancing their practical skills.

For instance, in the Robotics Engineering program, the number of laboratory hours has been increased based on existing professional courses. Through close cooperation with enterprises, practical teaching segments and content are meticulously crafted. Enterprises, leveraging their technological advantages, industry development trends, and local economic needs, collaborate with schools to develop a talent cultivation plan that meets the demands of emerging technologies and industrial development. This plan ensures precise matching between educational output and enterprise needs, achieving efficient talent cultivation.

4.3. Integrating Enterprise Resources to Cultivate Students' Innovative and Practical Abilities

The core of constructing new engineering disciplines lies in enhancing students' innovative and practical abilities, guided by the concept of engineering education. This requires assigning the responsibility of talent cultivation to each teacher. In teaching practice, students should deeply understand the essence and objectives of their professional courses and experimental segments, specifically how to transform theoretical knowledge into actual products. Students should actively participate in design experiments and comprehensive project training, experiencing the complete development process from concept to product realization. During this process, teachers should focus on improving students' self-management, teamwork, and engineering practice skills to cultivate high-quality engineering and technical talents capable of meeting future challenges.

Additionally, new engineering disciplines should include career planning courses and innovation and entrepreneurship project management courses. Senior technical personnel from enterprises should be invited to teach cutting-edge knowledge, helping students understand the development history, future trends, and applications of the robotics industry, and plan their future careers early. Long-term internship bases should be established with enterprises, allowing students to understand the core professional skills required for positions and grasp the specific content of pre-job training. A sound talent cultivation assessment mechanism should be in place, forming a collaborative education system that combines school-enterprise cooperation, industry-academia-research integration, and practical emphasis, ensuring that students can smoothly start their careers after graduation.

4.4. Joint Construction of Practical Teaching Platforms by Schools and Enterprises

The localization of industry-education integration has two aspects: pre-positioning industrial talent cultivation and industrializing university research capabilities. For universities, industrializing research capabilities means transforming industrial needs into scientific guidance; for industries, university research on applied theories is more in-depth, comprehensive, and extensive. Universities, with their rich educational experience and functional positioning, are more suitable for talent cultivation. However, university teachers generally lack practical abilities and project experience, necessitating the involvement of senior enterprise experts to jointly build a talent cultivation mechanism.

For example, in the Robotics Engineering program, a cooperation platform is established with enterprises based on the principles of resource sharing, complementary advantages, and mutual benefits, aiming at R&D, training, study, and exchange. This platform jointly builds practical teaching platforms to meet students' needs for cognitive internships, training, competitions, and technological innovation. Multiple technological research projects are jointly applied for and initiated, accelerating the output and transformation of technological innovation achievements. A working mechanism of "joint decision-making for transformation development, timely communication of supply and demand information, and coordinated joint cultivation" is established to cultivate students' practical innovation abilities and autonomous learning abilities in multiple dimensions.

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5. Conclusion

As a key force driving regional industrial economic development, the talent cultivation model for new engineering disciplines, optimized through industry-education integration strategies, can promote the deep integration of industry, academia, and research in local engineering colleges. This model is crucial for the transformation and upgrading of traditional manufacturing industries in the old industrial base of Northeast China, as it can cultivate urgently needed professional talents. Industry-education integration not only helps local universities clarify their responsibilities in educational activities but also fully leverages the active roles of teachers and students in industrial upgrading, thereby enhancing the quality and efficiency of talent cultivation. Moreover, it fosters close cooperation between universities and enterprises and deep integration of industries, ensuring a precise match between university talent cultivation and industry needs. This paper takes the example of the practical teaching platform jointly built by our university's Robotics Engineering program and enterprises, providing new perspectives and pathways for research on talent cultivation models in new engineering disciplines.

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