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Construction of a Research-Based Learning Curriculum System Integrating Science, Industry, and Education: Exploring Innovative Paths in Educational Practice

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Abstract: This paper delves into the challenges and opportunities in the current educational system and proposes an innovative talent cultivation model that integrates science, industry, and education. Through an analysis of issues such as problems with university construction mechanisms, inadequate alignment between schools and enterprises, the disconnection between theory and practice, and a lack of awareness of innovation and entrepreneurship education, this paper explores a model using geography-related majors in higher education as an example. It discusses talent cultivation strategies based on innovation, professionalism, and practical education. Additionally, this paper explores a new teaching practice model for research-based learning curriculum design, as well as the construction and implementation of the curriculum system.

Keywords: Educational system; Challenges and opportunities; Integration of science, industry, and education; Cultivation of innovative talents; Research-based learning curriculum system

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1. Introduction

Amidst the dual waves of globalization and informatization, the educational system is undergoing unprecedented changes. Faced with rapid social development and industrial upgrading, cultivating high-quality talents who can adapt to future needs has become a question that educators must consider. This paper aims to provide a new perspective and practical path for educational reform by deeply analyzing the pain points in the educational system and exploring an innovative talent cultivation model that integrates science, industry, and education for geography-related majors in higher education.

2. Challenges and opportunities in the current education system

With the nation's ongoing industrial transformation and economic growth, innovation and entrepreneurship education have become critical in meeting the demands of the new economic landscape, supporting the development of an innovation-driven country, and achieving technological leadership. In response, higher education institutions have leveraged their strategic role in talent cultivation to implement a series of comprehensive educational reforms. Industry-university-research (IUR) collaborative innovation between enterprises, universities, and research institutions is a key component of the national innovation system. The report of the 20th National Congress of the Communist Party of China explicitly emphasizes the need to strengthen enterprise-led deep integration of industry, academia, and research to enhance the transformation and industrialization of technological achievements. As a knowledge production activity with spillover effects, IUR collaborative innovation faces challenges due to the differing interests of the various stakeholders. Relying solely on the system itself is insufficient to overcome the "market failure" inherent in innovation activities. To maximize the synergistic effects of IUR collaboration, it is essential to leverage non-market external forces to compensate for the shortcomings of knowledge spillover [1].

The talent cultivation goal based on the integration of science and education, as well as the integration of industry and education, aims to create a new model of talent cultivation, strengthen cross-boundary integration, encourage cooperation and exchanges between different disciplines, and build a new discipline structure. This is achieved by deepening the teaching reform of basic education disciplines and normal professional programs, aggregating high-quality resources from multiple sources, improving the resource allocation mechanism, and emphasizing students' comprehensive abilities, innovative thinking, and problem-solving skills. The ultimate goal is to cultivate basic education talents who meet the needs of China's national conditions and possess modern practical application abilities and innovative capabilities.

2.1. Issues with university construction mechanisms

In the development process of higher education, three major mechanical defects have become increasingly prominent: uneven resource allocation, rigid management systems, and vague development positioning. The uneven distribution of resources has led to significant disparities in education quality, with a few prestigious universities occupying most of the high-quality resources, while most institutions face resource shortages. This urgently requires us to redistribute resources to promote education equity and benefit more universities and students. At the same time, the excessive administration and bureaucratization of management systems have restricted academic freedom and innovation, urgently needing to stimulate educational innovation by reducing administrative intervention and granting more autonomy to teachers and researchers [2]. Furthermore, in pursuit of scale and rankings, universities often overlook internal development and distinctive features. Clarifying development goals and building dominant disciplines have become crucial for achieving substantial development. In summary, deepening reforms in resource allocation, management systems, and development positioning are essential for constructing a fair, free, and innovative educational environment and cultivating high-quality talent.

2.2. Insufficient alignment between universities and enterprises

As the gap between enterprise demands and university talent cultivation continues to widen, three main issues have become increasingly apparent: the mismatch between professional settings and market needs, the disparity between practical teaching and enterprise skill requirements, and the inadequacy of university-enterprise

cooperation mechanisms. Professional settings in universities often lag behind industrial development, making it difficult for graduates to meet the actual market requirements. Simultaneously, there are significant differences between the practical teaching provided by universities and the skills required by enterprises, with teaching content failing to update in a timely manner to reflect the latest industry trends. Furthermore, cooperation between universities and enterprises lacks depth and breadth, with a single cooperation mode and a lack of sustained and effective cooperation mechanisms, further amplifying the misalignment between talent cultivation and market needs. Given this, reforming the talent cultivation model in universities and strengthening university-enterprise cooperation to cultivate talents that truly meet market demands has become an urgent task for educators.

2.3. Disconnect between theory and practice

Within the traditional education framework, a difficult-to-bridge gap exists between theoretical learning and practical application. This phenomenon mainly manifests in three aspects: overemphasis on theoretical content in teaching, inadequate practical teaching, and an imperfect assessment and evaluation system [3]. Course content often dwells excessively in the realm of theory, neglecting the cultivation of practical skills, which hinders the full development of students' practical abilities. Simultaneously, practical teaching activities such as experiments and internships often remain superficial, lacking substantive depth and effectiveness, thus failing to achieve the desired teaching objectives. Furthermore, the current evaluation system overly emphasizes theoretical knowledge while inadequately assessing practical abilities, undoubtedly widening the gap between theory and practice. Given this, exploring ways to tightly integrate theory with practice to enhance students' practical and innovative abilities has become a critical issue urgently needing resolution in educational reform.

2.4. Weak awareness of innovation and entrepreneurship education

In the strategic landscape of innovation-driven development, the central role of innovation and entrepreneurship education is increasingly prominent. Unfortunately, the shortcomings of the current education system in this aspect are becoming a significant obstacle for students to adapt to the challenges of the new era. Specifically, the construction of the innovation and entrepreneurship education system is still immature, lacking a coherent and systematic curriculum structure and training pathway. The teacher team feels inadequate in cultivating innovation abilities. Due to their lack of actual innovation and entrepreneurship experience, they find it difficult to effectively guide students. Meanwhile, students generally have a weak sense of innovation, constrained by the limitations of traditional educational concepts, and often lack the courage to explore and innovate independently [4]. These issues collectively reflect the shortcomings of innovation and entrepreneurship education in our country, urgently requiring us to take practical and effective measures to promote comprehensive improvement and enhancement.

3. Exploration and practice of the "integration of science and education, integration of industry and education" innovative talent training model

In the era of a knowledge-based economy, the cultivation of innovative talents has become a core issue in educational reform. Through specific case studies, this article explores the construction and practice of the "Integration of Science, Industry, and Education" talent training model, aiming to provide a reference path for cultivating high-quality talents with innovative spirit and practical abilities.

3.1. Talent cultivation based on innovation quality, professionalism, and practical education

In shaping future talents, the core objective is to cultivate students' innovative thinking and abilities through innovative curriculum design and teaching method reforms, thereby enhancing their innovation quality. Furthermore, this article deeply explores how to optimize the professional curriculum system based on industry development dynamics, aiming to deepen the connotation of professional education and enhance students' professional literacy. Recognizing the critical role of practical education in talent cultivation, this article analyzes strategies for constructing an efficient practical education system, aiming to strengthen the impact of practical education. This approach not only ensures that students can effectively integrate abstract theoretical knowledge with specific practical skills but also lays a solid practical foundation for their future careers.

3.2. Strategies for constructing the "integration of science, industry, and education" innovative talent training model

Based on the systematic integration of resources from Huizhou University, and primarily relying on Huizhou University Affiliated Kindergarten, Huizhou University Affiliated School, and other primary and secondary schools in Huizhou City with docking or support needs, we respond to the national call to build a "Science Cube" practical teaching base for the integration of science, industry, and education at Huizhou University. This base features local characteristics and can promote the long-term, stable, and "three-in-one" construction, enhancing the university's ability to serve the local community and contributing to the cultivation of application-oriented talents that seamlessly meet social needs. Specific strategies include integrating resources from universities, enterprises, and research institutions to achieve resource sharing and complementary advantages; optimizing the curriculum system and teaching content to ensure synchronization with industry development and realize dynamic adjustment and real-time updates; exploring the construction of the teaching faculty through talent introduction, teacher training, and cooperative exchanges to improve teachers' scientific research and practical teaching abilities; proposing an innovative education evaluation mechanism that establishes an evaluation system centered on innovation and practical abilities to motivate students' active learning and innovation; analyzing methods for creating an innovative talent training environment through campus culture construction and policy support to create favorable conditions for talent growth.

4. A new model of teaching practice for research and learning route design courses based on the integration of science, industry, and education

Courses are the fundamental path for talent cultivation. Centered on course construction, we integrate the teaching resources and high-quality resources of school-enterprise cooperation units, develop a practical curriculum system for geographical research and learning route design, continuously innovate teaching methods, integrate shared teaching platforms, and build a high-quality practical teaching curriculum system.

4.1. Research and learning route design courses based on the integration of science and education and the collaboration of industry and education

The core concept and profound value of the integration of science and education lie in its critical role played in the education stage. This integration not only accelerates the interaction and mutual progress between academic research and teaching practice but also injects continuous vitality into the overall improvement of education quality [4]. On this basis, the practical path of industry-education collaboration points us in a clear direction to

translate this concept into specific operational steps.

We promote the construction and innovation of geographical research and learning route design courses and teaching platforms through modern industrial colleges, experimental teaching demonstration centers, and other on-campus and off-campus platforms. We strengthen the integration of related professional course groups, teaching teams, and scientific research teams, cooperate with supporting units to innovate professional practice courses, and jointly develop practical teaching plans, content, goals, and assessment methods. This enables students to be exposed to and practice with the basic education industry in Huizhou City during the teaching and practical aspects of the training program. By adhering to the "theory-practice-theory" approach, students can better combine theory with practice, classroom knowledge with professional skills, moving from extrapolating from one example to understanding multiple examples and vice versa.

4.2. Innovation in teaching models and cultivation of students' innovative abilities

In the current rapid development of the knowledge-based economy, traditional teaching models have exposed their limitations in cultivating innovative talents, and the call for reforming teaching models is growing louder. To address this challenge, a series of innovative teaching methods and techniques have been carefully designed, including problem-based learning, case studies, interdisciplinary research, and other strategies aimed at fully stimulating students' innovative potential and enhancing their practical skills [5].

Through platforms such as the college's scientific research platform, the undergraduate innovation platform, academic competitions at various levels, the Smart Environment and Digital Cultural Tourism Modern Industrial College, and the Innovation and Entrepreneurship College, students' innovation abilities are enhanced, promoting a collaborative and innovative training model based on project-driven and mentor cluster guidance.

Meanwhile, efforts are being made to build a teaching evaluation system centered on innovation ability, and through an efficient feedback mechanism, continuously optimize the teaching process, ensuring that teaching quality and talent cultivation goals promote each other. This comprehensive teaching model, which fully integrates innovative teaching strategies and evaluation feedback mechanisms, injects lasting momentum into education, effectively promotes the comprehensive improvement of students' innovative abilities, and lays a solid foundation for cultivating high-quality talents who can adapt to the needs of society in the future.

5. Construction of the curriculum system for research and learning route design

The curriculum system is an important carrier for transforming educational philosophies into educational practices. This article delves into how to construct a scientific, efficient, and contemporary curriculum system for research and learning route design, and develops corresponding implementation strategies to ensure the quality and effectiveness of talent cultivation.

5.1. Integrated teaching from disciplinary foundations to professional basics, practical internships, and industries/sectors

In the grand blueprint of education, strengthening disciplinary foundation courses is like laying the cornerstone of a knowledge edifice. Through the ingenious integration of interdisciplinary knowledge, it provides students with a broad and profound theoretical platform for their subsequent academic exploration and career development [6]. On this foundation, professional basic courses such as "Physical Geography," "Human Geography," "Cartography," and "Principles and Applications of Geographic Information Systems" closely

follow the latest trends and demands of the industry. Through carefully designed modular teaching strategies, these courses further hone and enhance students' professional knowledge and skills, enabling them to better adapt to future workplace challenges.

As learning progresses, strengthening practical internship links becomes a crucial aspect of cultivating students' abilities. This aspect tightly integrates abstract theoretical teaching with specific practical operations, guiding students off the campus to conduct research and learning course practices in various townships, primary and secondary schools, and fields. This allows students to exercise their practical abilities and problem-solving skills in real or simulated work environments, thereby adequately preparing them for their future careers.

Finally, the comprehensive practical link in industries/sectors brings students' academic journeys to a climax. In this link, students have the opportunity to integrate their learned knowledge into specific industry or sector-related engineering design projects, such as developing research and learning route design systems based on cloud platforms, combining professional knowledge learned in geography subjects with various professional software. This not only tests their mastery of theoretical knowledge but also challenges their innovative thinking and engineering practice abilities [7]. It achieves a seamless connection between professions and industries/sectors, enabling team achievements to not only feed back into the classroom but also better benefit the industry and society.

Through the teaching of this curriculum system, students not only learn how to transform theory into practical results but also cultivate various abilities such as critical thinking, teamwork, and project management in this process. This achieves a comprehensive ability improvement from theory to practice, laying a solid foundation for students to become leading figures in the engineering field of the future.

5.2. Comprehensive, multi-dimensional, and practical innovation and entrepreneurship education

The design philosophy of comprehensive innovation and entrepreneurship education aims to integrate the cultivation of innovative spirit and entrepreneurial abilities throughout students' entire learning process, from enrollment to graduation, forming a continuously expanding educational trajectory. This educational model is holistic, covering all levels from theoretical courses to practical activities, and is committed to building a diverse and multi-dimensional educational system.

In the curriculum design of research and learning routes, we not only pursue the depth and breadth of theory but also emphasize the applicability and innovativeness of practice. Through diversified means such as practical activities and competition coaching, we provide students with rich and vivid experiences in innovation and entrepreneurship. As an indispensable link in the education chain, practical educational experiences allow students to hone their innovation and entrepreneurship skills in real business environments and market challenges through various forms such as simulating the entrepreneurial process, corporate internship opportunities, and project-based practical operations [8].

The goal of this educational model is to ensure that upon successfully completing their studies, students not only master solid theoretical knowledge of innovation and entrepreneurship but also gain valuable practical experience and profound market insight. With the help of this educational model, students can effectively bridge the gap between theory and practice, laying a solid foundation for emerging in fierce market competition in the future and growing into the backbone of society with an innovative spirit and entrepreneurial abilities.

5.3. Alignment of course content with industry standards

In the current rapidly evolving economic landscape, the enhancement of education quality and the simultaneous updating of industry demands have become core issues in educational reform [9]. To achieve this goal, we must deeply explore and accurately interpret the dynamic changes in industry standards. Based on this, we can fine-tune and optimize course content, ensuring that teaching materials are closely integrated with practical applications while also being forward-looking for future development.

Since 2016, when the Ministry of Education and ten other departments issued the *Opinions on Promoting Research and Learning Travel for Primary and Middle School Students*, the document has emphasized the importance of research and learning travel courses and promoted their healthy and rapid development. To achieve seamless integration between education and industry, a series of practical and effective strategies needs to be adopted. Inviting enterprises to participate in the design of research and learning route courses ensures that teaching content keeps pace with the latest developments in the industry. Introducing industry experts into teaching brings valuable practical experience into the classroom, enriching students' learning experiences. Promoting deep cooperation between industry, academia, and research combines theoretical knowledge with practical operations through specific project practices, providing students with a platform for practical innovation [10].

6. Conclusion

Through the exploration in this article, not only have many challenges in the education system been revealed, but also the promising prospects of the integration of science, industry, and education, as well as the cultivation of innovative talents, have been envisioned. Taking the research and learning route design course as an example, constructing a scientific, efficient, and contemporary curriculum system, and implementing comprehensive and multi-level educational strategies are key to cultivating leading talents for the future society. We believe that through continuous exploration and practice, China's education system will be further improved, able to cultivate more high-quality talents with innovative spirits and practical abilities, and make greater contributions to the country's prosperity and development.

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Disclosure statement

The authors declare no conflict of interest.

References

[1] Zhao H, Wang Y, 2023, Research on the Mechanism of Government Intervention in the Collaborative Innovation

of Industry, Education, and Research in Vocational Colleges from the Perspective of "Science, Industry, and Education" Integration. Economist, (12): 162–163 + 166.

[2] Yin W, Li H, 2023, Cultivating Innovative and Entrepreneurial Talents through the Integration of Industry and Education: Constructing an Interactive Educational Actor Network in the Field. Journal of East China University of Science and Technology (Social Science Edition), 38(02): 120–124 + 148.

[3] Wang Y, 2022, Research on the Construction of Ideological and Political Education System in Agricultural Colleges under the Background of Industry-Education Integration—A Review of "Research on the Reform and Innovation of Ideological and Political Theory Courses in Agricultural and Forestry Universities in the New Era." Chinese Agricultural Meteorology, 43(08): 677.

[4] Zhang F, 2022, Construction of an Innovation and Entrepreneurship Education Ecosystem in Vocational Colleges under the Background of Industry-Education Integration. Journal of Shazhou Vocational Institute of Technology, 25(01): 26–29.

[5] Guo X, 2022, Construction of a Micro-ecosystem for the Integration of Vocational Education and Industry in the Era of Education 2.0—Taking the Fashion Engineering Innovation Center Project as an Example. Chemical Fiber & Textile Technology, 51(02): 228–230.

[6] Shi Y, Huang X, Lv D, et al., 2021, Construction of an Innovative Ecosystem for the Integration of Industry and Education Based on a New Model of Knowledge Production in the Context of Vocational Education Modernization. Industrial and Technological Forum, 20(24): 225–226.

[7] Li J, 2021, Research on the Construction of a Collaborative Education Mechanism for Innovation and Entrepreneurship Education in Universities under the Background of Industry-Education Integration. Education and Vocation, (15): 73–77.

[8] Li X, 2021, Construction of an Innovation and Entrepreneurship Education Curriculum System for Fashion Design and Technology Majors under the Background of Deepening "Industry-Education Integration." Western Leather, 43(09): 33–34.

[9] Xu J, 2021, Analysis on the Construction of Talent Training Mechanism in Vocational Colleges under the Background of Industry-Education Integration—A Review of "Institutional Innovation of Industry-Education Integration in Vocational Education." Forest Products Industry, 58(02): 120.

[10] Yu Z, Li C, Qin M, 2020, Exploration on the Construction of a University Innovation and Entrepreneurship Education Community Based on the Integration of Industry and Education. Innovation and Entrepreneurship Theory and Practice, 3(19): 97–98.