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The Characteristics and Practices of Economics and Management Talents Training in Beijing Institute of Petrochemical Technology

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Abstract

Centered on serving Beijing's "four centers" construction, Beijing Institute of Petrochemical Technology (BIPT) strengthens engineering-management integration and industry-education collaboration via "digitalization and intelligence" technologies, cultivating talents with "risk & emergency management" and "energy efficiency & dual-carbon management" features. Its talent training philosophy shifts toward practical application, interdisciplinary integration, and demand orientation. The university establishes three-dimensional objectives across "theory + practice", "virtual simulation + practical operation", and "research + reform", supported by a "school-enterprise-government" collaborative model and a three-dimensional curriculum system (general education, digital intelligence, professional courses, practical training). Practical outcomes include high graduate satisfaction (95% teaching satisfaction), over 120 national awards since 2022, and significant research outputs. BIPT's approach offers a viable model for application-oriented universities to develop distinctive economics and management talent cultivation.

Keywords

Application-Oriented Universities, Economics and Management Talents Training, Engineering-Management Integration, Industry-Education Collaboration, Digitalization and Intelligence

1. Introduction

How application-oriented engineering universities can develop distinctive characteristics in the cultivation of economics and management talents to better serve regional economic and social development is a process of innovation, accumula-

tion, refinement, and development (Li & Liu, 2022). Beijing Institute of Petrochemical Technology has explored and practiced this approach. Focusing on serving the construction of the capital's "four centers" functions, the university aims to build a distinctive high-level application-oriented university, reshaping its disciplinary and professional clusters and embarking on a new journey to create a cradle of engineers for the premier district in the new era. The School of Economics and Management fully leverages the advantages of being an engineering university in the capital, utilizing the significant interfacing role of "digitization and intelligence" technologies between "new engineering" and "new humanities and social sciences" (Luo, Meng, & Cai, 2018), strengthening the integration of engineering and management, deepening the integration of industry and education, as well as implementing an integrated approach to talent cultivation that combines teaching, competition, learning, research, and application. Targeting two major service areas of urban safety operation and energy low-carbon transformation and focusing on two distinctive directions of "risk and emergency management" and "energy efficiency and dual-carbon management", the school carries out specialized training of economics and management talents with features of "+safety and emergency" and "+green dual-carbon". According to the 2021 graduate training quality evaluation report by MyCOS, the fit between student training and the employment market is relatively high, with 95% of graduates expressing satisfaction with the school's teaching, 90% satisfaction with practical training activities, and 93% adaptability to their positions. The relevance of graduates' work to their major, average monthly income, and job satisfaction have all been continuously improving.

2. Talent Training Concept

Under the requirements for cultivating applied talents (He, Zhang, & Wei, 2012), the School of Economics and Management has transformed its talent cultivation philosophy in three key ways: shifting from "knowledge transmission" to "practical application"; moving from "professional segmentation" to "interdisciplinary integration"; transitioning from "discipline-oriented" to "demand-driven". This shift has laid the foundation for cultivating high-level distinctive talents in the fields of "+safety and emergency" and "+green dual carbon".

In the field of safety and emergency, a deeply integrated platform among government, industry, academia, and research in the regional emergency management domain has been progressively established. Relying on the Beijing Safety Production Engineering Technology Research Institute platform, the institute has founded the Emergency Management Research Institute. As a key technical support unit, it has fully participated in the "Pilot Work of Coordinated Response to Safety Production Accidents in the Beijing-Tianjin-Hebei Region" organized by the National Emergency Rescue Command Center. It has hosted the Beijing-Tianjin-Hebei Safety Production Emergency Management Liaison Meeting and the joint exercises for coordinated response to accidents in the Beijing-Tianjin-Hebei

region for two consecutive years. It initiated the establishment of the Safety and Emergency Professional Committee of the Zhongguancun "Belt and Road" Industrial Promotion Association and hosted the first "China-Russia Emergency Management Forum". The "Urban Risk Management Salon" academic forum was created, organizing more than 20 high-level academic exchange activities. It also hosted the Beijing Science Association's decision-making consultation salon on "Enhancing Grassroots Emergency Capacity and Consolidating the Foundation of Resilient Cities". Several government-accepted consultation reports have been formed, such as the "Beijing Emergency Management 13th Five-Year Plan Research Report" and the "Interim Measures for the Management of Beijing Safety Production Accident Professional Emergency Teams".

In the field of green dual-carbon, the influence of cultivating economic and management talents in the green dual-carbon field has been continuously enhanced. The institute leverages multidisciplinary intersection platforms, including Beijing Modern Industrial New Area Development Research Base, Energy Environment and Low-Carbon Development Research Center, and Capital Clean Energy Supply and Use Security Technology Collaborative Innovation Center. Its research focuses on Regional coordinated development and strategic layout of clean energy, Impact of Beijing-Tianjin-Hebei industrial transfer on energy efficiency, and Collaborative carbon reduction mechanisms and policies in the Beijing-Tianjin-Hebei region. These achievements have provided critical references for government decision-making. A report titled "The Construction and Practice of New Engineering and New Humanities and Social Sciences Talent Cultivation System with ESG Awareness and Ability under the Background of Dual-Carbon Strategy" was presented by the institute's teachers at the 2023 National (Petroleum) Chemical Engineering College Undergraduate Teaching Work Seminar, achieving good social benefits.

In recent years, the institute has produced a wealth of research results. More than 40 books and textbooks, such as "Research on the Coordinated Carbon Reduction Mechanism in the Beijing-Tianjin-Hebei Region from the Perspective of Industrial Transfer" and "Research on Chinese Urban Industrial Planning Based on Green Ecological Concept" have been published. The institute has published over 120 papers in CSSCI/SSCI/core journals, including "Regional Collaborative Response Strategies to Accidents under Vertical Administrative Constraints-Taking the Beijing-Tianjin-Hebei Coordinated Response to Accidents as an Example" and "The Impact of Population Agglomeration in the Beijing-Tianjin-Hebei Region on Energy Consumption". These publications effectively support and enrich educational teaching. Students have participated in the Beijing-Tianjin-Hebei coordinated response to safety production accident disaster drills, conducted social practice activities and scientific research such as surveys on the construction of intelligent parks in the southern Beijing logistics base, research on rural energy consumption and assistance to low-income households in Daxing District, and the construction and mining of air quality and carbon emission databases in the Beijing-Tianjin-Hebei region. They have published more than 50 academic papers

and achieved good results in academic competitions and graduation designs.

3. Talent Training Objectives

In response to the needs of digital economic development and corporate digital transformation, the School of Economics and Management has developed multiple virtual simulation platforms. These platforms feature "digitalization and intelligence" as the interface for integrating engineering and management. This initiative is part of constructing Beijing's first-class undergraduate programs, including Big Data Management and Application, Accounting, and Marketing. Focusing on the two directions of "risk and emergency management" and "energy efficiency and dual-carbon management", the school cultivates distinctive economics and management talents who are "application-oriented-integrated-specialized" (Chen & Chen, 2024). These talents not only master the theories and methods of economic management but also possess digital and intelligent thinking and technologies, and can solve complex management problems. To achieve this, the school advances the attainment of the talent cultivation objectives from three dimensions: "theory + practice", "virtual simulation + practical operation", and "research + reform".

In the dimension of "theory + practice", the barriers between theoretical and practical courses are broken down, and the entire curriculum system is integrated with the concept of "knowledge and ability inter-embedding". On one hand, in the "general education module" of the training program, a "cross-disciplinary and interdisciplinary sub-module" is designed to highlight the complexity and professionalism of theoretical teaching. This module offers courses in New-generation information technology, Artificial intelligence, Ecological and environmental protection, Carbon peak and carbon neutrality, and Safety emergency response. These courses aim to cultivate students' digital thinking, safety responsibility, and low-carbon awareness, and enable theoretical courses to fulfill their role of "empowering through knowledge". On the other hand, practical course systems are designed to correspond to the theoretical teaching content to strengthen the applicability of theoretical knowledge in practical teaching. Specifically, basic practical courses such as "Professional Understanding Internship", "Engineering Training", and "Digital Transformation Management Training" are designed to match the foundational courses of the discipline and the general education courses for lower grades, emphasizing the application of basic economic management theories and primary digital technology methods. Professional practical courses such as "Virtual Business Society Comprehensive Training" and "ERP Software Internship" are designed to match professional theoretical courses and general education courses for higher grades, emphasizing the application of professional theories and advanced digital technology methods. Comprehensive practical courses such as "Professional Comprehensive Internship" and "Project Planning Internship" are designed to match the "Graduation Design (Thesis)", emphasizing the comprehensive application of theoretical knowledge.

In the dimension of "virtual simulation + practical operation", the school has established close cooperative relationships with information technology companies such as Yonyou Software, Jiuzhi Software, Digital China, and Beijing Grenier, strengthening the construction and management of experimental centers and simulation training software platforms to cultivate students' digital management levels and practical innovation abilities in an all-round way. According to the competition system data established by the school, since 2022, students from our school have won more than 120 awards in various national and provincial-level competitions such as the National "Internet Plus" College Students Innovation and Entrepreneurship Competition, the "Challenge Cup" National College Students Entrepreneurship Plan Competition, the National College Students E-commerce Challenge, the National College Students Business Elite Challenge, and the National College Students Energy Conservation and Emission Reduction Social Practice and Science and Technology Competition. More than 300 students have won awards, covering all professional students in the school. Among them, "Green Travel 'Hydrogen' Life—Social Survey Research on Hydrogen Energy Vehicles in Beijing" and "Analysis of Consumers' Willingness and Influencing Factors of 'Low-Carbon Packaging' under the Background of 'Waste-Free City' Construction" won the second prize in the National College Students Energy Conservation and Emission Reduction Social Practice and Science and Technology Competition and the second prize in the Beijing College Students Energy Conservation, Water Saving, and Low-Carbon Emission Reduction Social Practice and Science and Technology Competition, respectively.

In the dimension of "research + reform", active academic and teaching reform research is conducted to provide theoretical guidance and methodological instructions for teaching and talent cultivation (Zhang, 2023). In the past five years, research has been carried out around directions such as risk management and intelligent decision-making, energy development and evaluation, ESG and sustainable management, etc., and nearly 30 national natural science funds, social science funds, and provincial-level major scientific research projects such as "Research on the Material Guarantee Mechanism of Cross-Regional Coordinated Disposal of Major Emergencies" and "Game Prediction of Carbon Emission Trading Behavior in Complex Interactive Scenes Driven by Data" have been completed. The planning of the Wisdom Logistics Park of Beijing E-Commerce Center District (CED) and the E-commerce Development Plan of Beijing Yongminkang Medical Technology Co., Ltd. have been completed, empowering the digital development of enterprises and winning the first and third prizes of the China Council for the Promotion of International Trade Science and Technology Award once each. Undertaken Ministry of Education industry-university cooperative projects such as "Curriculum Reform and Teaching Innovation of 'Big Data and Accounting Analysis' Based on Inspur Big Data Platform" and "Curriculum Construction of 'Digital Marketing Comprehensive Training'", and Beijing higher education undergraduate teaching innovation and reform projects such as "Research and Practice of New Business

Integration of Economics and Management Majors and Big Data" and "Reform and Optimization of the Industry-Education Integration and Collaborative Training Mechanism of New Business Talents under the Background of Digitalization". According to the scientific research system data established by the school, 33 teaching reform projects have been approved, such as "Research on the Evaluation Mechanism of Deep Learning Effect Achievement of Undergraduates in Application-Oriented Colleges". Among them, "Innovation and Practice of 'Knowledge and Ability Inter-Embedding' Practice Teaching System of Economics and Management Majors Based on Outcome Orientation" won the second prize of the Beijing Higher Education Teaching Achievement Award.

4. Education Model of Industry-Education Integration

Under the above training philosophy and objectives, the school actively strengthens school-government and school-enterprise cooperation to build a collaborative talent cultivation model of "deep integration of schools, enterprises, and governments" (Li, 2023). In terms of school-local cooperation, the school has established close cooperative relationships with government departments such as the Beijing Emergency Management Bureau and Tongzhou Emergency Management Bureau, and association units such as the Chamber of Commerce, Beijing Certified Public Accountants Association, and Beijing E-commerce Association in the form of project entrustment and decision-making consultation. In terms of school-enterprise cooperation, the school cooperates with enterprises such as Yanshan Petrochemical, New Path Technology Co., Ltd., Beijing Grenier, China Enterprise Safety and Environment, and Hangxin Hydropower in the forms of teacher training, practical teaching, project entrustment, and professional co-construction. A total of 23 courses have been co-built, covering all students at the school every year.

Figure 1 presents the cultivation of distinctive economics and management talents in "risk and emergency management" as an example to show the collaborative talent cultivation model of schools, enterprises, and governments. During the theoretical learning stage, the school partners with enterprises, including New Path Technology, Beijing Grenier, and Wisdom Cloud Future Technology, to build experimental centers and training platforms, and create experimental environments and course groups for "risk and emergency management" application scenarios. This initiative focuses on cultivating students' comprehension and mastery of economic management theories, awareness of emergency safety concepts, and proficiency in digital technologies. In the practical application stage, students are guided to participate in scientific research projects and scientific training activities to cultivate their practical application abilities in mining key issues of emergency management, analyzing core elements, and innovating solutions. Students not only verify the role and scope of theoretical knowledge in practice but also expand and innovate theories, achieving an orderly connection between theoretical learning, practical application, and industry demands.

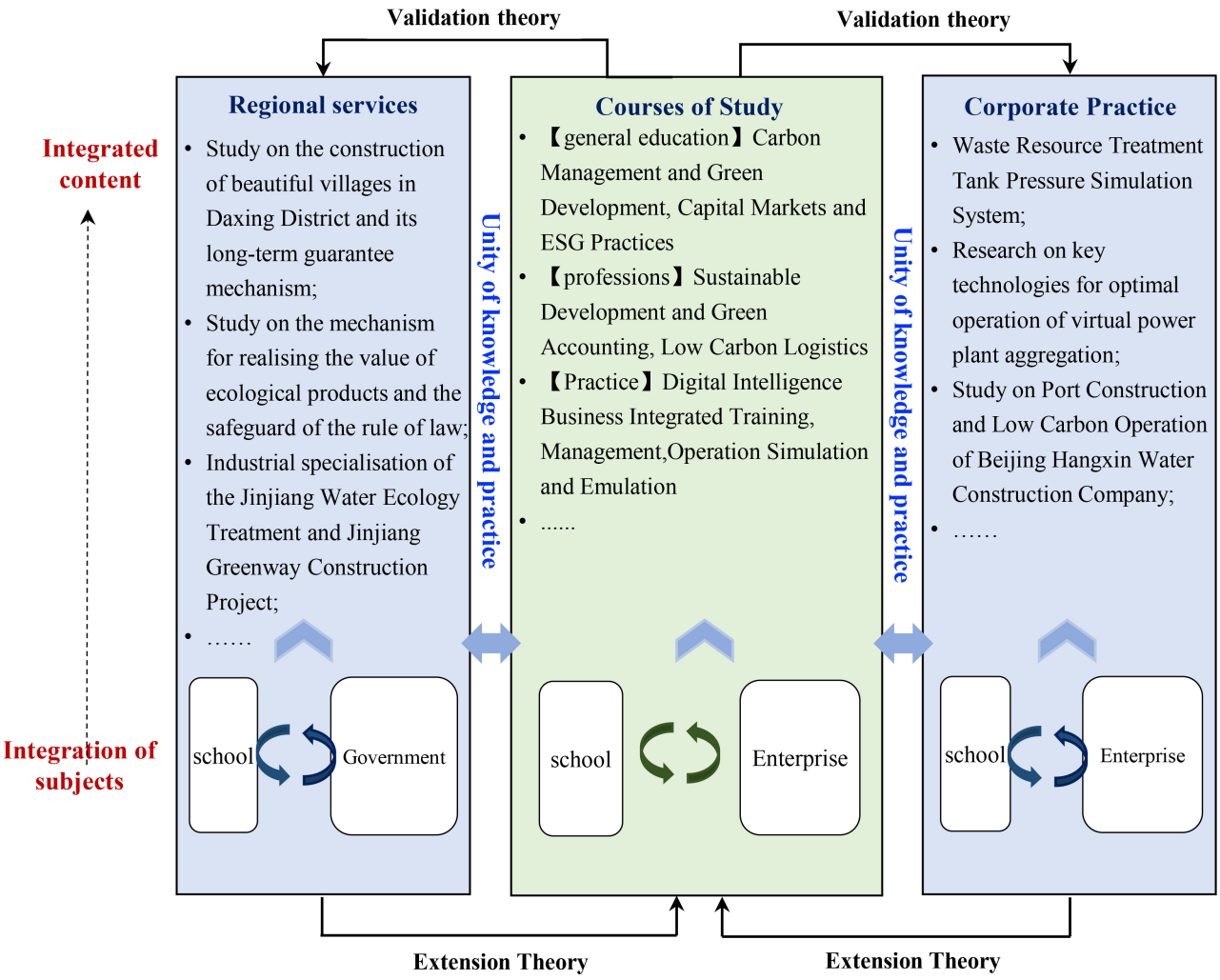

Figure 1. The "school-enterprise-government" collaborative education model under the characteristic direction of "risk and emergency management".

5. Multi-Dimensional Curriculum System

To achieve the talent cultivation objectives, a graduation requirement is designed around the framework of "knowledge-ability-quality", and a curriculum system is constructed to form a three-level association implementation matrix of "cultivation objectives-graduation requirements-curriculum system". A three-dimensional curriculum system comprising four modules: general education courses, digital intelligence courses, professional courses, and practical courses, is established. **Figure 2** illustrates the construction logic of the curriculum system, taking the logistics management major as an example. In addition to conventional courses such as ideological and political theory, foreign language and culture, and physical education, the general education course module also includes characteristic courses on safety, emergency, and green dual carbon. Through general education courses, students gain an understanding of industry background, regulations, and development trends in urban safety operations, as well as the dynamics of energy low-

carbon transformation. This forms a critical foundation for cultivating interdisciplinary professionals. The digital intelligence course module integrates economic & management expertise with computer science and technology, focusing on Big Data, blockchain, artificial intelligence, and the Internet of Things. It is dedicated to fostering digitally intelligent economic and management talents proficient in interdisciplinary technology. The professional and practical course modules are the key links in the transmission and comprehensive application of professional knowledge, supporting the cultivation of specialized and application-oriented economics and management talents.

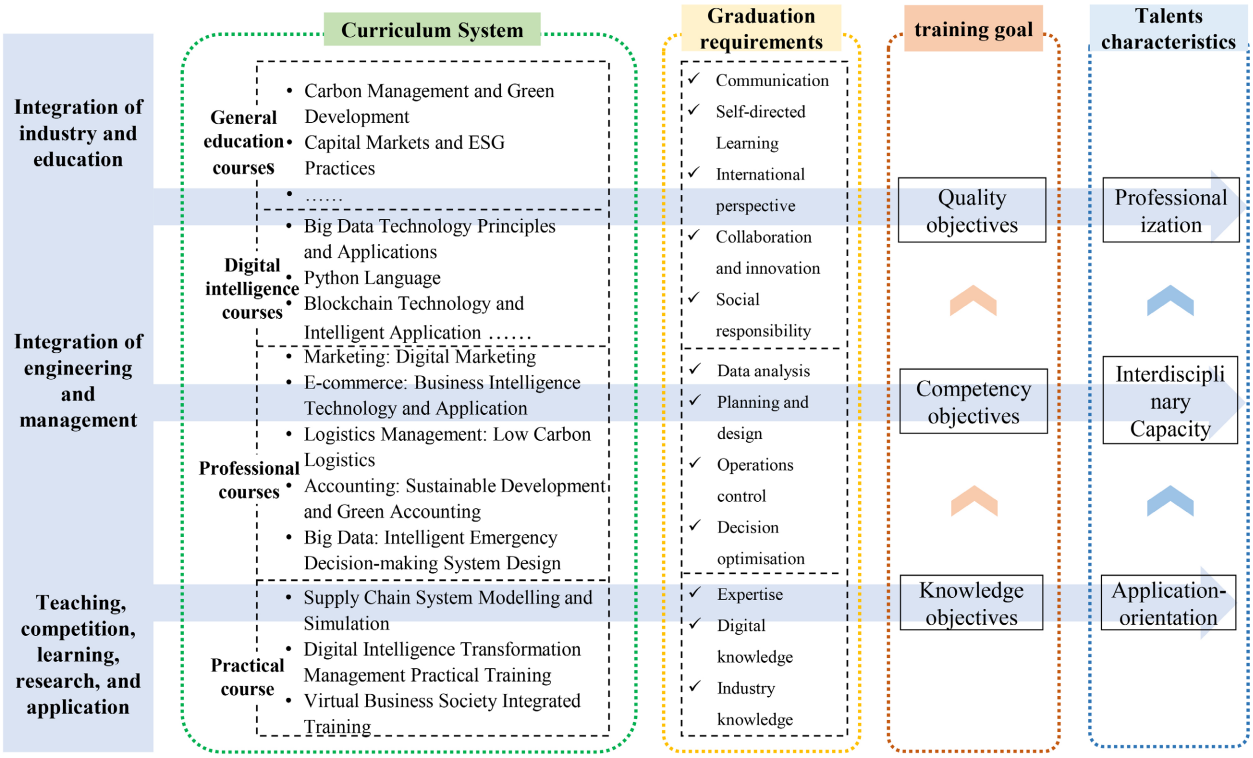

Figure 2. The construction logic of the curriculum system for the logistics management major.

Guided by the cultivation logic of "knowledge acquisition, ability enhancement, and quality development" and using the "four-module" three-dimensional curriculum system as the main framework, the model integrates a "school-enterprise-government" collaborative talent cultivation mechanism and an integrated training process of "teaching, competition, learning, research, and application" (Wang, 2021). This constructs a "research-oriented and progressively structured" course framework. Specifically, starting from course teaching, with discipline competitions, scientific research projects, and social services as the handles, relying on the real projects, cases, scenarios, and data resources of government departments and enterprises, a joint effort is made to cultivate students. From 2018 to 2023, among the undergraduate graduation theses of the whole school, 145 and 114 theses were closely related to the two characteristic directions of "risk and emergency man-

agement" and "energy efficiency and dual-carbon management", respectively. More than 20 theses, such as "Research on the Optimization of Electric Tricycle-UAV Collaborative Distribution Path under the Epidemic" and "Trend Analysis of Renewable Energy Power Generation under the Carbon Peak Target", were rated as outstanding undergraduate graduation theses in Beijing. The "research-oriented and progressively structured" course framework empowers economics and management talents in four dual-characteristic dimensions: 1) Enabling students to grasp industry safety and green demands; 2) Equipping them to master digital management technologies integrated with safety-green concepts; 3) Enhancing their ability to apply interdisciplinary theories of economics, management, safety, and green practices; 4) Cultivating skills to solve real-world safety-green management challenges in corporate operations.

6. Professional Teaching Staff Team

On one hand, the school continuously increases the intensity of teacher recruitment, attracting economic and management faculty with engineering backgrounds or industry experience, dedicated to building a high-quality "dual-teacher dual-capability" teaching team (Skaalvik & Skaalvik, 2019). At the same time, adhering to the principle of resource sharing, the school breaks through the boundaries of professional education, shares high-quality resources such as intra-school course resources and internship platforms, and promotes communication and collaboration among the faculty of the School of Economics and Management and engineering colleges such as the School of Information Engineering, School of Safety Engineering, and School of Engineers.

On the other hand, based on the existing school-enterprise-government cooperation platform, school teachers are selected to take up positions in enterprises and institutions such as the Beijing Emergency Management Bureau, the National E-commerce Demonstration Base E-commerce Center, and the Beijing Economic and Technological Development Area for practical training, to enhance the practical innovation ability of the teaching team (Inoue & Takeshita, 2025); outstanding alumni and enterprise professionals are hired to teach industry knowledge and professional courses, timely introducing new technologies, concepts, and methods from the front line of production and management; more than 20 industry experts and education group executives are actively introduced, implementing the "dual-mentor" training model of "intra-school academic mentors + extra-school industry mentors".

7. Conclusion

With the continuous popularization of higher education and the adjustment of regional industrial structures, the reality of "marginalization" and "homogenization" in the cultivation of economics and management talents in application-oriented engineering universities has become more severe. Developing distinctive features has become an important choice for such universities to break out of their

predicaments and form competitive advantages. To explore the distinctive cultivation of economics and management talents in application-oriented engineering universities, this paper explores the characteristics and practices of economics and management talent cultivation at Beijing Institute of Petrochemical Technology. The practice at BIPT demonstrates that the distinctive cultivation of economics and management talents is a feasible approach to focusing on features, and the talent cultivation models of "integration of engineering and management + integration of industry and education," as well as the integrated process, are effective paths to achieving these features. This study provides reference values for application-oriented engineering universities to strengthen the distinctive cultivation of economics and management talents.

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Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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