

Implementation Paths for the Industry-Education Integration Collaborative Education Model of Modern Industry Colleges in Jiangxi Undergraduate Universities

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Biography

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Funding

This work was supported by the Key Project of Teaching Reform Research in Higher Education Institutions in Jiangxi Province (JXJG-23-4-2), and the Humanities and Social Sciences Research Project of Universities in Jiangxi Province (GL25119).

Ethical Approval

All procedures conducted in this study involving human participants adhered to the ethical standards set by the institutional research committee. They were also in compliance with the principles outlined in the 1964 Declaration of Helsinki and its subsequent revisions or equivalent ethical guidelines.

Abstract: Modern industry colleges are an important platform for deepening industry-education integration and cultivating application-oriented talents. Based on advanced cases of talent cultivation through industry-education integration in modern industry colleges at selected universities in China, and in light of the current status of talent cultivation in modern industry colleges of undergraduate universities in Jiangxi Province as well as relevant national and provincial policy documents, this paper proposes implementation paths and policy suggestions for the industry-education integration collaborative education model of modern industry colleges in Jiangxi undergraduate universities from the macro institutional level, the meso industrial level,

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and the micro subject level. The aim is to provide a reference for the construction of modern industry colleges in Jiangxi Province.

Keywords: modern industry college; industry-education integration; collaborative education; implementation path; Jiangxi

1. Introduction

With the rapid development of the global economy, traditional industries are undergoing continuous upgrading, while emerging industries such as artificial intelligence, big data, and new energy are rising rapidly. Under these circumstances, traditional models of talent cultivation in higher education are no longer sufficient. To meet the needs of industrial restructuring and upgrading in the intelligent era, universities must establish integrated platforms for industry-university-research collaboration, explore diversified talent cultivation models, and cultivate innovative, high-quality talents^[10, 4].

The Communist Party of China Central Committee, with Comrade Xi Jinping at its core, has attached great importance to promoting and developing industry-education integration. The report to the 19th National Congress of the Communist Party of China explicitly proposed the major reform task of “deepening industry-education integration.” In 2017, the first policy document with “industry-education integration” as its central theme was issued. In 2020, the General Office of the Ministry of Education and the General Office of the Ministry of Industry and Information Technology released the Guidelines for the Construction of Modern Industry Colleges (Trial), which provided clear guidance for universities and multiple social actors to jointly build industry colleges. Since then, the construction of industry colleges has been elevated to an unprecedented level as an important vehicle for realizing industry-education integration and collaborative education^[10]. In response to these policy requirements, the Jiangxi Provincial Department of Education and the Jiangxi Provincial Department of Industry and Information Technology issued the Notice on Announcing the First Batch of Approved Construction Projects for Modern Industry Colleges in Regular Undergraduate Universities in Jiangxi Province in 2022. The notice identified the first batch of provincial-level modern industry college construction projects, including nine key projects and twelve cultivation projects, thereby marking the beginning of the construction of modern industry colleges in Jiangxi Province.

2. Analysis of the Current Status of Industry-Education Integration and Collaborative Education in Modern Industry Colleges of Jiangxi Undergraduate Universities

At present, universities in Jiangxi Province have gradually established a government-university-enterprise collaborative education system in the construction of industry colleges through policy guidance and institutional innovation^[2]. In terms of policy support, the Jiangxi Provincial Department of Education has actively promoted industry-education integration and issued the Implementation Plan for the Construction of Modern Industry Colleges in Regular Undergraduate Universities in Jiangxi Province. The plan aims to ensure that by 2025, each undergraduate university will establish at least one modern industry college, while application-oriented

undergraduate universities will build several such colleges, thereby providing policy support for industry-education integration.

In terms of practice, universities in Jiangxi Province have actively promoted the construction of modern industry colleges, advanced the deep integration of industry and education, and gradually formed an integrated education model combining industry, university, research, and application [9, 2]. For example, relying on national first-class undergraduate major construction sites such as metallurgical engineering and metallic materials engineering, Jiangxi University of Science and Technology has made full use of Yingtang's regional advantages in the copper industry chain and jointly established the Advanced Copper Industry College with the Yingtang Municipal People's Government, Jiangxi Copper Corporation, and other stakeholders. Jiangxi University of Engineering's Intelligent Manufacturing Industry College has optimized its disciplinary structure and curriculum system, adding several first-class undergraduate majors and first-class undergraduate major construction sites. In addition, universities in Jiangxi Province have continuously improved the support mechanisms for industry-education integration. For instance, Nanchang University has integrated enterprise resources through the "bringing enterprises into education" model, providing high-quality teaching staff and financial support for universities and further consolidating the foundation of industry-education integration [2].

Although the construction of modern industry colleges in Jiangxi Province has achieved phased progress, it still faces deep-seated structural contradictions in university-enterprise collaboration [9, 2]. According to a special survey conducted by the Jiangxi Provincial Department of Education in 2023, several problems remain prominent, including the low participation of core enterprises, with a participation rate of only 35%; inflexible independent operating mechanisms; insufficient sharing of university-enterprise resources, with an equipment sharing rate of less than 22%; poor two-way personnel mobility; inadequate depth of industry-education integration; and the mismatch between traditional educational management systems and the development needs of industry colleges. These problems have resulted in a misalignment between the talent cultivation model of Jiangxi undergraduate universities and the requirements of industrial transformation, upgrading, and local economic development. Therefore, Jiangxi Province urgently needs to explore effective paths for achieving in-depth university-enterprise cooperation through the construction of modern industry colleges, building a collaborative education model based on industry-education integration, and cultivating diversified, innovative, and application-oriented technical talents.

3. Implementation Paths for the Industry-Education Integration Collaborative Education Model of Modern Industry Colleges in Jiangxi Undergraduate Universities

In the industry-education integration collaborative education model of modern industry colleges in Jiangxi undergraduate universities, the implementation paths can be developed from three dimensions: the macro institutional level, the meso industrial level, and the micro subject level.

3.1 Macro Institutional Level: Strengthening Top-Level Design and Improving the Policy System

3.1.1 Improving the Legal System for Industry-Education Integration and Clarifying the Responsibilities and Obligations of Universities and Enterprises

On the basis of policy documents such as the Several Opinions of the General Office of the State Council on Deepening Industry-Education Integration and the Implementation Plan for National Pilot Programs of Industry-Education Integration, relevant regulations and implementation rules on industry-education integration should be formulated more quickly to provide solid legal support for its effective implementation. Specifically, legislation can be used to clarify the principal role of enterprises in industry-education integration, define their specific responsibilities in talent cultivation, technological research and development, and resource sharing, and at the same time clarify the obligations of universities in curriculum design, practical teaching, and faculty development ^[7]. For example, Zhejiang Province issued the Regulations on Promoting School-Enterprise Cooperation in Vocational Education, which clarify the rights and obligations of enterprises participating in vocational education and establish an assessment and evaluation mechanism for school-enterprise cooperation. In addition, relevant regulations on intellectual property protection should be improved to encourage application-oriented undergraduate universities and enterprises to conduct applied research and development and promote technology transfer ^[10]. For instance, Jiangsu Province established a “university-enterprise intellectual property sharing mechanism,” which promoted the cooperation between Nanjing Tech University and Sinopec Nanjing Engineering Co., Ltd. in the research and development of “intelligent chemical engineering equipment technology.” The two parties jointly applied for 12 patents, and the technology transfer revenue exceeded 50 million yuan. This not only generated significant economic benefits but also cultivated a group of high-quality technical talents.

3.1.2 Improving Incentive Mechanisms for Industry-Education Integration and Guiding Enterprises to Participate Deeply

Local education administrative departments should build, by category and level, a number of demonstration universities, disciplines, majors, and curriculum systems for industry-education integration that serve high-quality industrial development. Development and reform departments should promote the certification of industry-education integrated enterprises and provide certified enterprises with combined incentives involving finance, fiscal support, land, and credit ^[10]. For example, Guangdong Province provides certified enterprises with up to 5 million yuan in financial support and gives priority to their land-use needs, which has successfully attracted leading enterprises such as Huawei and Tencent to participate deeply in vocational education.

In addition, the government should establish incentive mechanisms for industry-education integration and provide recognition and rewards to universities and enterprises that perform well in this field. This can stimulate the enthusiasm and creativity of both sides and promote the deeper development of industry-education integration ^[4]. For example, the Jiangsu Provincial Department of Education designated Nanjing Institute of Technology as a “Jiangsu Provincial Demonstration University for Industry-Education Integration,” granted it an honorary title and special financial support, and provided tax incentives and project subsidies to its partner enterprise, CRRC Nanjing Puzhen Co., Ltd.

3.1.3 Constructing a Diversified Evaluation System and Improving the Quality Assurance Mechanism

Industry-education collaborative education involves multiple stakeholders, including universities, enterprises, industries, and government departments, whose goals and needs differ from one another [3]. Therefore, it is necessary to construct a diversified evaluation system and establish a clear assessment process to ensure the objectivity and effectiveness of evaluation results. Specifically, efforts can be made in the following three aspects.

First, an evaluation system jointly involving universities, enterprises, industry associations, government departments, and students should be established to give full play to the advantages of all parties. For example, universities should focus on evaluating whether teaching meets the requirements of industry-education integration; enterprises should mainly assess whether the cultivated talents meet actual job requirements; industry associations should consider whether the training process meets industry standards; government departments should ensure that industry-education integration is consistent with policy requirements and regional development strategies; and students should evaluate it from the perspectives of learning experience and personal development.

Second, the evaluation content should be clarified, and scientific evaluation standards should be established. For example, in terms of curriculum and teaching, emphasis should be placed on whether the curriculum is closely aligned with industrial practice and whether the proportion of practical teaching is reasonable. In terms of the teaching staff, attention should be paid to teachers' enterprise practice experience and industry background. In terms of learning outcomes, focus should be placed on students' employment quality and their performance in enterprise practice, and a graduate tracking and feedback mechanism should be established. In terms of enterprise participation, the extent of enterprise investment in talent cultivation program formulation, curriculum development, and internship and training base construction should be assessed, such as the number of enterprise participants in teaching activities and the quantity and quality of internship positions provided.

Third, the quality assurance mechanism should be improved to form an internally and externally coordinated support system. In terms of internal assurance, special administrative departments for industry-education integration should be established to coordinate communication among teaching departments, internship and employment departments, and universities and enterprises, while strengthening supervision and management of the industry-education integration process. For example, Chongqing College of Electronic Engineering established an "Industry-Education Integration Office," assigned full-time staff, and created a regular communication mechanism. In terms of external assurance, the role of industry associations should be fully utilized to formulate industry-wide quality standards for industry-education integration and promote industry, enterprise, and international professional certification.

3.2 Meso Industrial Level: Strengthening the Hub Function and Creating a New Pattern of Industry-Education Collaboration

3.2.1 Promoting Resource Integration and Platform Co-construction to Break Down Barriers to University-Enterprise Collaboration

The most convenient way to address the mismatch between university scientific and technological achievements and enterprise demands is to establish a resource-sharing platform between the two

sides ^[6]. At present, the transformation of scientific and technological achievements in universities mainly relies on university websites and some commercial paid platforms for information release. This fragmented information dissemination model not only increases the difficulty of information collection but also hinders the market-oriented promotion of scientific and technological achievements to a certain extent. Therefore, establishing a specialized service platform for the transformation of scientific and technological achievements is of practical significance. Such a platform can effectively integrate university research resources, break down information barriers between research institutions and enterprises, and promote the efficient matching of their respective needs.

To ensure the smooth operation of the platform, industry associations should be coordinated to play a guiding role and carry out extensive publicity among universities, research institutes, and enterprises. Through this platform, researchers can conveniently obtain information on enterprises' technological demands and clarify enterprises' technical application objectives, thereby achieving accurate matching between research achievements and market needs. This two-way interactive information matching mechanism not only reduces the information release costs for researchers but also provides enterprises with convenient access to innovative technologies, ultimately promoting a significant improvement in the efficiency of transforming scientific and technological achievements in universities.

3.2.2 Promoting Stakeholder Collaboration and Value Co-creation to Build a New Pattern of an Ecological Industry-Education Community

Industry associations play an important role at the meso industrial level. As important bridges connecting governments, enterprises, and vocational colleges, they can formulate and implement industry standards, supervise and manage the quality of industry products and services, and promote university-enterprise cooperation and talent cultivation ^[9], thereby enhancing the sustainability of university-enterprise cooperation. Industry associations should, in line with their own development trends, coordinate the interests of multiple parties and build an ecosystem for industry-education integration by formulating industry standards, establishing industry-based educational systems and requirements, developing policy suggestions and supervision mechanisms, and promoting the co-construction and sharing of resources such as curricula, equipment, and teaching staff.

For example, in the case of industry-education integration in Guangzhou, industry associations have helped enterprises obtain policy and financial support, reduce their burdens, and actively guide the construction of industry-education integrated enterprises through regular and institutionalized coordination mechanisms. In addition, industry associations need to play a neutral role in the process of industry-education integration by coordinating the interests of governments, universities, and enterprises. For instance, when conflicts of objectives arise, industry associations can serve as a connecting mechanism for interest distribution and social support services.

3.3 Micro Subject Level: Promoting University-Enterprise Co-creation and Building a Closed-Loop Education Ecosystem

3.3.1 University Level: Innovating Educational Models and Stimulating Institutional Vitality

Building an innovative teaching staff and activating internal teaching motivation. University teachers generally possess profound theoretical knowledge, but they often lack sufficient enterprise practice experience. By contrast, enterprise technical personnel usually have rich practical experience, but may be deficient in teaching methods and educational concepts [5]. Therefore, universities should focus on building a teaching team with both theoretical teaching competence and practical professional ability. By deepening university-enterprise cooperation, universities should encourage teachers to participate in enterprise practice, professional training, and technological research and development, so as to improve their practical literacy and teaching ability. For example, Henan University of Urban Construction has revised and improved its measures for the identification and management of teachers with both theoretical and practical competence, improved the evaluation system for teachers' engineering practice activities and outcomes, and linked the evaluation results with faculty appointment, professional title promotion, and performance assessment. These measures have promoted the graded and categorized identification of teachers with both theoretical and practical competence. In addition, universities should explore the implementation of a special post system for industry mentors. By improving the introduction standards, qualification certification, and dynamic appointment mechanisms for part-time industry teachers, universities can systematically involve experts from industry associations, enterprise technical backbones, and management personnel in teaching activities [1]. For example, in the fields of bioengineering and food science, Jiangnan University has cooperated with enterprises such as Bright Dairy and China Resources Beer to establish "special posts for industry mentors." Senior engineers from enterprises are invited to participate in the design of course modules such as Food Intelligent Manufacturing and Fermentation Engineering Practice, and to guide students in aligning graduation project topics with real enterprise technological problems.

Accurately positioning talent cultivation and enhancing alignment with industrial needs. In the process of talent cultivation, undergraduate universities should take serving regional economic development as their orientation, closely align with the practical needs of industrial transformation and upgrading, and clarify the objectives and direction of talent cultivation. By conducting in-depth research on industry development trends and enterprise employment demands, universities can scientifically formulate talent cultivation programs and ensure that curriculum design and teaching content remain synchronized with industrial development dynamics [9]. For example, in response to emerging industries and areas with talent shortages, universities may establish distinctive majors or specialized directions to cultivate interdisciplinary talents with both knowledge integration ability and practical competence. In addition, by introducing real enterprise projects and case-based teaching, universities can improve students' professional literacy and job adaptability, ensure the seamless connection between talent cultivation and industrial demand, and provide strong talent support for high-quality regional economic development.

Constructing a dynamic feedback mechanism and accurately adapting to industrial development needs. Undergraduate education should adhere to the talent cultivation concept of being "market-oriented, technology-based, and employment-targeted." Universities should establish special working groups and build regular communication mechanisms with industry associations and leading enterprises, so as to obtain the latest industry trends and technical requirements in a timely manner. They should also conduct in-depth discussions on problems and optimization plans in the cooperation process, regularly revise teaching syllabi, ensure that teaching content remains

synchronized with enterprise technological development, adjust curriculum settings in response to the latest market requirements, and ultimately realize a virtuous cycle of “promoting teaching through application and promoting application through teaching” [2]. At the same time, universities should track graduates’ employment outcomes, regularly collect enterprise feedback, and dynamically adjust the content and direction of talent cultivation programs [9]. For example, in response to the rapid development of the new energy vehicle industry, universities can promptly establish majors related to new energy vehicle technology and adjust the relevant curriculum system, ensuring that students can directly serve the new energy vehicle industry chain after graduation. In addition, universities need to improve their internal quality assurance systems, objectively evaluate teaching quality according to internationally recognized standards, generate feedback reports, and update them at prescribed intervals. This can encourage universities to respond proactively in areas such as textbook renewal, teaching method reform, and experimental equipment upgrading.

3.3.2 Enterprise Level: Strengthening Practical Support and Deeply Participating in Competence Development

Deepening industry-education integration and constructing a collaborative education mechanism. Enterprises should actively participate in the collaborative education model of higher education institutions. Through university-enterprise cooperation, they should jointly develop curriculum systems and teaching content that meet industrial needs, making teaching content more closely aligned with real workplace scenarios and helping students better adapt to industrial requirements. For example, Tencent has carried out in-depth cooperation with South China University of Technology to jointly establish the “Artificial Intelligence Innovation College.” This initiative has built a collaborative education mechanism featuring deep integration between the education chain and the industrial chain, and has become a benchmark case of industry-education integration in undergraduate universities.

Strengthening practical teaching and job alignment, and optimizing employment services. Enterprises should actively participate in the construction of practical teaching links. By providing internship and training bases, job cognition practice, and other forms of practical learning, enterprises can improve students’ hands-on ability and capacity to solve practical problems. They can also jointly establish “pre-employment classes” through named classes and order-based classes, thereby achieving a “win-win” situation among universities, employers, and students and promoting high-quality and stable employment for students [8]. For example, the “Lanyue Engineer Class,” a collaborative education practice program jointly developed by China Aerospace Science and Industry Corporation and Beijing Institute of Technology, selects junior students into order-based classes through an “aerospace literacy test plus engineering innovation ability assessment,” which includes subjects such as spacecraft orbit calculation and complex system modeling. Enterprises provide customized courses such as Intelligent Control of Spacecraft and Extreme Environment Testing of Aerospace Materials, while also connecting students to enterprise research and development data platforms, such as semi-physical simulation data for a certain type of missile guidance system. Through this full-scenario practical system, the program breaks through the limitations of traditional university-enterprise cooperation that focuses merely on customized employment, constructs an innovative ecosystem integrating technology co-research, talent co-cultivation, and value sharing, and truly realizes a new paradigm of

industry-education integration in which students “enter the industry upon enrollment and become leading professionals upon graduation.”

4. Conclusion

In promoting the industry-education integration collaborative education model of modern industry colleges in Jiangxi undergraduate universities, multiple stakeholders, including universities, enterprises, the government, and industry associations, need to work collaboratively and form joint efforts. First, the government should play a role in policy guidance and resource integration, improve the institutional support system for industry-education integration, and promote university-enterprise cooperation toward a deeper level. Second, industry associations should serve as bridges and links, promote information sharing and resource coordination, and provide universities and enterprises with frontier industry trends and technical support. Enterprises should deeply participate in the teaching process by providing real projects, technical support, and practical platforms, so as to ensure seamless alignment between talent cultivation and industry demand. Finally, universities should innovate educational models, optimize talent cultivation programs, and improve students' practical abilities and innovative literacy.

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