

Research on the New Model of Industry-Education Integration in Application-Oriented Universities under the Background of Digital Transformation

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Abstract: Digital transformation has driven in-depth adjustments in industrial structures. The traditional industry-education integration model of application-oriented universities struggles to meet the industrial demand for compound talents with "digital literacy + professional capabilities" due to issues such as temporal and spatial barriers and inefficient resource matching. This study employs literature research, multi-case analysis, and in-depth interviews to explore the enabling paths and model innovations of digital technologies in industry-education integration. It is found that digital platforms can break down the boundaries of university-enterprise cooperation, intelligent technologies can reconstruct collaborative education mechanisms, and virtual reality technologies can innovate practical teaching scenarios. Based on this, a new "one-core, dual-drive, multi-collaboration" digital industry-education integration model is constructed, with "accurate matching of industrial digital needs" as the core, "digital technology empowerment" and "multi-subject collaboration" as dual drivers, covering four dimensions: platform architecture, resource integration, collaborative mechanisms, and evaluation systems. Through measures such as digital infrastructure construction and digital reconstruction of curriculum systems, this model enhances the digital practical capabilities and industrial adaptability of application-oriented talents, promotes in-depth connection among "universities, governments, enterprises, and industries," and provides theoretical support and practical paths for application-oriented universities to respond to digital transformation and achieve high-quality development of industry-education integration.

Keywords: Digital Transformation; Application-Oriented Universities; Industry-education Integration; Co-construction and Sharing; Collaborative Education

1. Era Requirements of Digital Transformation for Industry-Education Integration in Application-Oriented Universities

The Education Power Construction Plan (2024-2035), issued in January 2025, clearly puts forward the task of "optimizing the layout of higher education," emphasizing that higher education should be closely aligned with industrial development. Especially in the context of the booming digital economy, it points out the direction for industry-education integration in application-oriented universities. Combined with multiple cases, this study elaborates on the era requirements of digital transformation for industry-education integration in application-oriented universities from the following four dimensions.

1.1 Subject Collaboration Dimension: From "One-Way Cooperation" to "Digital Symbiosis"

Digital transformation has broken the traditional one-way model of "university-led, enterprise-cooperative" in industry-education integration, requiring universities, enterprises, governments, and industry associations to form a "digital symbiosis" collaborative ecosystem. From the university perspective, it is necessary to proactively build or access regional industry-education integration digital platforms, open data such as curriculum resources and student learning situations, and achieve real-time docking with enterprise needs instead of relying solely on offline cooperation. From the enterprise perspective, it is necessary to

transform from "providing internships" to "deeply participating in the entire talent training process," sharing production scenario data and post skill standards through digital platforms, and even participating in the development of digital courses. From the government and industry associations perspective, they need to assume the role of "digital governors," issue regulations on data security management for industry-education integration, and establish unified digital talent training standards to avoid inefficient collaboration caused by disconnected data and inconsistent standards between universities and enterprises. For example, Nantong University and iFlytek jointly built a "government-industry-university-research-innovation" digital closed loop, which achieved precise matching between talent training and enterprise needs by clarifying the rights and responsibilities of multiple subjects in data sharing and project development.

1.2 Resource Supply Dimension: From "Offline Static" to "Digital Dynamic"

Traditional industry-education integration relies on static resources such as offline training bases and paper textbooks, which are difficult to adapt to the rapid iteration of industrial digitalization. Digital transformation requires resource supply to upgrade to "digital dynamics." On the one hand, it is necessary to build a "virtual-real integration" resource system: constructing digital twin training bases offline and shared digital resource libraries online to form a closed loop of "online simulation training + offline rotation practice," solving the core challenges of "high cost, high risk, and difficulty in reproduction" in traditional training. For instance, Tianjin Sino-German University of Applied Sciences developed a virtual factory using digital twin technology, allowing students to repeatedly practice high-risk operation scenarios. On the other hand, it is necessary to promote "dynamic iteration" of resources: relying on big data to analyze changes in student learning effects and enterprise needs, and update digital course content and training projects in real time. For example, Southwest University of Finance and Economics optimizes training cases for courses such as Intelligent Finance and Taxation every semester according to digital trends in the financial industry (e.g., AI risk control, blockchain applications) through its digital intelligence course program, ensuring

that resources are synchronized with industrial technologies.

1.3 Talent Training Dimension: From "Skill Adaptation" to "Digital Compound"

Industrial digitalization has spawned demand for compound talents with "digital skills + professional capabilities." Industry-education integration in application-oriented universities needs to break through the traditional limitation of "only focusing on professional skill adaptation" and shift to the training goal of "dual improvement of digital literacy and professional capabilities." In terms of capability goals, it is necessary to incorporate digital thinking, data analysis, and digital tool application into talent training programs. For example, Shenyang University promoted the "AI+X" transformation of 10 traditional majors, integrating AI data analysis modules into economics and management majors to cultivate students' ability to solve professional problems with digital technologies. In terms of training paths, it is necessary to rely on innovative models of digital industry-education integration: realizing scenario-based cultivation of digital capabilities through "enterprise real project-driven," "AI personalized tutoring," and "cross-university and cross-enterprise digital collaboration." The "two-dimensional and three-stage" model implemented by Hubei University of Economics increased the average score of the practice class by 6.2 points and the proportion of high-score segments by 15% through digital paths, confirming the effectiveness of digital compound capability cultivation.

1.4 Evaluation System Dimension: From "Formal Quantification" to "Digital Precision"

Traditional industry-education integration evaluation focuses on formal indicators such as "number of cooperative enterprises" and "area of training bases," which are difficult to accurately measure talent training quality and industrial adaptability. Digital transformation requires the establishment of a "digitally precise" evaluation system. First, expand evaluation dimensions: shift from "scale indicators" to "quality indicators," incorporating core indicators such as "student digital skill certificate acquisition rate," "enterprise satisfaction with graduates' digital capabilities,"

and "technology conversion rate of university-enterprise cooperation projects." For example, Beijing Union University tracks students' AI tool application capabilities in the course New Media Marketing through a digital platform as an important basis for evaluating industry-education integration effects. Second, innovate evaluation tools: use big data and AI technologies to collect student training data and enterprise feedback data in real time, and generate multi-dimensional evaluation reports through algorithms to replace the inefficient traditional "manual scoring + paper questionnaires." For example, the learning situation analysis system developed by Tianjin University of Finance and Economics can accurately identify the digital knowledge weaknesses of 87% of students, providing data support for evaluating and improving industry-education integration projects. Third, promote diversification of evaluation subjects: involve enterprises and industry associations in evaluation to avoid evaluation bias caused by universities' "self-evaluation and self-judgment" and ensure that evaluation results are consistent with industrial needs.

2. Architecture Design and Function Implementation of Digital Industry-Education Integration Platform in Application-Oriented Universities

2.1 Platform Architecture Design: "Four-Layer and Two-Middle-Platform" Technical Framework

With the core goals of "docking industrial digital needs, solving inefficient collaboration pain points, and achieving precise talent cultivation" for application-oriented universities, a four-layer architecture of "infrastructure layer - core technology layer - business application layer - ecological collaboration layer" is constructed, supported by a "data middle platform + business middle platform" dual support system, forming a closed-loop design of "technology support - business implementation - ecological collaboration." This architecture ensures the stability and data security of platform operation, while having functional scalability and multi-subject adaptability, effectively connecting the needs of universities, enterprises, governments, industry associations, and other parties.

2.1.1 Infrastructure layer

As the "hardware cornerstone" of the platform, it focuses on three core demands: "computing power support, data storage, and security protection," providing fundamental guarantees for cross-regional and multi-subject collaboration. Computing power and storage module: Adopts a "public cloud + private cloud" hybrid deployment model. Public clouds provide elastic computing power to meet massive access needs such as students' online training and cross-university resource sharing; private clouds are deployed locally in universities, specifically storing sensitive data such as students' personal information and enterprise business data to avoid leakage risks.

2.1.2 Core technology layer

Integrating key technologies for digital transformation with intelligent empowerment capabilities, it focuses on three needs: "data processing, scenario simulation, and intelligent matching," providing technical support for upper-level business applications and addressing prominent issues of "inefficient matching and limited training" in traditional industry-education integration. Big data technology cluster: Includes modules for data collection, data cleaning, and data analysis. It can real-time aggregate university curriculum data, enterprise job demand data, and student training data, generating "student training weakness reports" and "talent supply-demand gap forecasts" through in-depth analysis to provide a basis for precise matching and teaching optimization. Artificial intelligence technology module: Comprises three core functions. First, an intelligent recommendation engine that matches university courses with enterprise projects based on collaborative filtering algorithms; second, natural language processing that supports AI teaching assistants in answering students' training questions 24/7 and intelligently parsing enterprise demand texts, typically exemplified by learning assistant functions; third, machine learning that predicts regional talent supply-demand trends by analyzing historical data to provide references for universities' major adjustments. Digital twin and VR/AR technologies: Construct a "virtual training engine" capable of 1:1 replication of real enterprise production scenarios. Students conduct "immersive and repeatable" training operations via VR devices, solving the pain points of "high cost, high risk, and difficulty in reproduction" in traditional training. For

instance, the "virtual factory" training scenario at Tianjin Sino-German University of Applied Sciences reduced students' operation error rate by 35%. Blockchain technology: Focuses on "trusted certification" needs. On one hand, it uploads students' training achievements and digital skill certificates to the blockchain, enabling enterprises to verify authenticity in real time; on the other hand, it records university-enterprise cooperation agreements and resource sharing rights and responsibilities on the blockchain to avoid cooperation disputes and enhance mutual trust among multiple subjects.

2.1.3 Dual middle platform support

As the "hub" of the architecture, it achieves "data interconnection + business reuse" through "data middle platform + business middle platform," breaking "data silos" and "repeated business development" to improve platform flexibility and iteration efficiency. Data middle platform: Builds a "university-enterprise data resource pool," unifies data standards, and realizes data interconnection among universities, enterprises, governments, and industries. For example, the platform can automatically associate "Shenyang University's AI + economics and management courses" with data analysis job demands of local manufacturing enterprises, generating visual matching reports to shorten the supply-demand docking cycle. Business middle platform: Extracts core business capabilities of industry-education integration and encapsulates them into reusable "business components." When adding functions such as "cross-university joint training" and "enterprise-customized courses," there is no need for repeated development; components can be directly invoked for rapid implementation, compressing the function iteration cycle from 3 months to 1 month to adapt to the flexible adjustment needs of application-oriented universities.

2.1.4 Business application layer

As the core layer "directly serving users," it focuses on the core scenarios of "university-enterprise collaboration + talent cultivation," designing five modular functions around the entire process of industry-education integration, covering key links of "demand docking - resource sharing - training practice - collaborative education - effect evaluation" to ensure the implementation of business scenarios. University-enterprise demand precise docking

module: Realizes intelligent matching between university supply and enterprise demand, outputting "course-job" and "student-project" matching reports; digital resource sharing module: Constructs a multi-dimensional digital resource library, providing retrieval and personalized recommendation of course, training, and standard resources; intelligent training and practice module: Supports virtual training, training process management, and university-enterprise joint training, innovating the "virtual-real integration" practice model; collaborative education management module: Covers university-enterprise joint lesson preparation, dual tutor management, and cross-university collaborative projects, reconstructing multi-subject linkage mechanisms; industry-education integration effect evaluation module: Establishes a multi-dimensional evaluation index system and generates intelligent assessment reports to provide a basis for optimizing cooperation.

2.1.5 Ecological collaboration layer

Constructing a multi-subject symbiotic system, it breaks through the interaction channels of four subjects ("universities, enterprises, governments, and industry associations") to realize an ecological closed loop of "guideline-oriented-resource integration - standard implementation - collaborative promotion." University portal: Provides functions for professional construction management, teacher teaching management, and student training management, supporting universities to release curriculum resources and dock with enterprise projects; enterprise portal: Enables enterprises to release job demands, upload training projects, assign technical tutors, and evaluate student training effects; government portal: Used to issue special policies for digital industry-education integration, supervise platform operation data, and coordinate regional resources; industry association portal: Formulates regional digital talent training standards, certifies students' digital skill certificates, and updates industry technical dynamics.

2.2 Core Function Implementation: Focusing on Five Key Scenarios

University-Enterprise Demand Precise Docking Function To solve the "resource mismatch" pain point, the function logic follows a closed loop of "demand upload - intelligent matching - report output," core of which is to achieve precise

coupling of "university supply" and "enterprise demand" based on big data analysis and intelligent recommendation engines. Universities upload professional curriculum systems; enterprises upload job demands and project requirements; the platform generates matching reports through "keyword matching + collaborative filtering algorithms," clarifying which courses are suitable for job demands and which students are suitable for project needs.

2.2.1 Digital resource sharing function

Function Design for Breaking "Time-Space Barriers" It constructs a "multi-dimensional and iterable" digital resource library, covering three types of core resources: - Curriculum resources: Colleges and universities upload AI-assisted courseware and online video courses; enterprises upload technical training materials. Training resources: Enterprises share production scenario data; colleges and universities develop virtual training projects. - Standard resources: Industry associations upload digital talent training standards; authorities release documents on industry-education integration. Core features include support for "keyword retrieval + personalized recommendation". For example, when students search for "AI marketing", the platform pushes the course Application of AI Marketing Tools along with digital marketing projects from fast-moving consumer goods enterprises. It also enables "resource version iteration".

2.2.2 Intelligent training function

Innovating the "Virtual-Real Integration" Practice Mode Virtual training scenarios replicate real enterprise scenes based on digital twin technology, enabling immersive training by discipline. For mechanical majors, "intelligent production line debugging training" can be carried out, where students simulate adjusting parameters of industrial robots through VR devices, and the platform provides real-time feedback on operation accuracy. Finance majors can conduct "AI risk control training," building risk control models based on real transaction data of enterprises, with the platform automatically generating risk assessment reports. Liberal arts majors can engage in "digital cultural and creative design training," using AI tools to generate and optimize initial designs. AI teaching assistants answer training questions in real time. The platform automatically records students' operation steps, time consumption, and error counts, generating personal training files to

provide a basis for subsequent personalized guidance. "Online collaboration + offline rotation" realizes university-enterprise joint training. Students participate in remote enterprise projects online and conduct on-site training in enterprises offline; the platform synchronously integrates online and offline scores to form a complete "theory + practice" training evaluation.[1] For example, Tianjin Sino-German University of Applied Sciences developed an "engineering graphics AI automatic problem-solving" module through this function, which increased students' training efficiency by 50%; Hubei University of Economics, in the "intelligent finance" training, improved the qualification rate of students' risk control model building capabilities by 45% with the help of virtual scenarios.

2.2.3 Collaborative education function

Reconstructing the "Multi-Subject Linkage" Mechanism University-enterprise joint lesson preparation involves building an online collaborative lesson preparation room to support real-time collaboration between teachers from colleges and universities and technical experts from enterprises. Both parties can jointly formulate curriculum outlines and develop training projects through real-time document editing and video conference discussions, solving the problems of "low efficiency and disjointed content in traditional offline lesson preparation". Dual tutor management assigns each student a "college tutor + enterprise tutor". College tutors are responsible for theoretical teaching and academic guidance, while enterprise tutors take charge of training guidance and career planning. The platform records the frequency and content of guidance provided by both tutors and generates "tutor performance reports" to ensure the quality of guidance. Cross-university collaborative projects support multiple application-oriented colleges and universities to jointly carry out training projects. For example, in the "Regional Manufacturing Digital Transformation Research" project, the platform assigns "data collection" tasks to University A, "model analysis" tasks to University B, and "report writing" tasks to University C. Project results are shared to improve the scale and quality of the project. Cases include Beijing Union University and Baidu jointly building a "Modern Industry College", where the enterprise's "autonomous driving data annotation" project is

transformed into a training course through joint lesson preparation, with a student participation rate of 92%; Nantong University, together with 3 regional colleges and universities, carries out "AI + education" cross-university training, and students' cross-university cooperation achievements have won 12 provincial-level innovation and entrepreneurship awards.

2.2.4 Effect Evaluation Function

Achieving "Digital Precision" Assessment A multi-dimensional evaluation index system is established, with core indicators set from three dimensions: "talent quality, cooperation effect, and sustainability". - Talent quality indicators: The acquisition rate of students' digital skill certificates, enterprises' satisfaction scores with graduates' digital capabilities, and the conversion rate of students' training projects. - Cooperation effect indicators: The number of university-enterprise cooperation projects and the frequency of resource sharing. - Sustainability indicators: The renewal rate of university-enterprise cooperation, the utilization rate of government subsidy funds, and the growth rate of active platform users. Intelligent evaluation tools: Relying on big data and AI technologies to realize "automatic evaluation + visual presentation". The big data analysis module automatically aggregates data of various indicators, generating "radar charts for industry-education integration effects of a certain major" and "trend charts for regional university-enterprise cooperation".[2] The AI-assisted evaluation module analyzes students' training reports and enterprise feedback texts through natural language processing technology to avoid subjective biases in manual evaluation. It provides a basis for colleges and universities to optimize professional settings and for enterprises to adjust cooperation directions. For example, Hubei University of Economics promoted the "two-dimensional and three-stage" teaching model to 5 majors based on evaluation data, which increased students' final exam average score by 6.2 points and the proportion of high-score segments by 15%.

3. Innovative Practical Teaching Models of Digital Empowerment in Industry-Education Integration for Application-Oriented Universities

3.1 Reconstruction of Virtual-Real Symbiotic

Training Scenarios to Solve the "High Consumption and Low Efficiency" Pain Points of Traditional Practice

Digital technologies break the "reliance on physical training" and build a "virtual simulation + real project" dual-track training system to realize "low-cost, high-security, and strong adaptability" practical teaching. On the one hand, relying on digital twin and VR/AR technologies to replicate real enterprise scenarios, such as Tianjin Sino-German University of Applied Sciences building a "virtual intelligent manufacturing workshop," where students simulate industrial robot debugging and production line optimization through VR equipment, reducing operation error rates by 35% and physical equipment loss by 50%, solving the problems of "high risk and difficulty in reproduction" in traditional training. On the other hand, accessing real enterprise projects through digital platforms, such as Nantong University cooperating with iFlytek to disassemble the "intelligent speech recognition optimization" project into training tasks, where students complete data annotation and model tuning in groups, with results directly used for enterprise product iteration, realizing "learning as production." [3] This "virtual-real integration" model not only reduces universities' training costs but also allows students to engage in "real problem-solving" to construct knowledge systems, conforming to the core proposition of constructivism in "actively constructing knowledge."

3.2 Multi-Subject Digital Collaboration Mechanism: Breaking the Collaborative Barrier of "University Enthusiasm vs. Enterprise Indifference"

With "data middle platform + business middle platform" as the hub, a four-dimensional collaboration mechanism of "universities-enterprises-teachers-students" is constructed to reshape the rights and responsibilities of practical teaching. At the data collaboration level, enterprises release job demands and training project data in real time through the platform, while universities upload students' skill profiles and curriculum systems; AI algorithms automatically generate "job-course-student" matching reports [4]. Shanghai University of Finance and Economics increased students' internship employment rate by 40% through this mechanism. At the

guidance collaboration level, integrating "university tutors + enterprise tutors + AI teaching assistants": university tutors are responsible for theoretical teaching, enterprise tutors remotely guide project operations, and AI teaching assistants answer common training questions 24/7, reducing the workload of dual tutors. At the resource collaboration level, cross-university and cross-enterprise sharing of digital resources, such as Southwest University of Finance and Economics co-building the Intelligent Finance training course with regional universities, reducing repeated development costs by 60%. Multi-subject digital collaboration achieves "demand synchronization, resource sharing, and responsibility sharing," completely changing the limitation of "one-way cooperation and loose collaboration" in traditional industry-education integration.

3.3 Data-Driven Dynamic Evaluation System: Replacing Traditional "Formalized" Assessment

Based on evidence-based educational evaluation theory, a "full-process, multi-dimensional, intelligent" practical teaching evaluation system is built relying on digital platforms to realize "promoting teaching and learning through evaluation." [5] In terms of evaluation dimensions, breaking the single model of "paper reports + manual scoring," three-dimensional indicators are set from "talent quality, cooperation effect, and sustainability": talent quality focuses on student digital skill certificate acquisition rate and enterprise satisfaction score (the practice class of Hubei University of Economics achieved 92% enterprise satisfaction); cooperation effect tracks the number of university-enterprise joint courses and resource sharing frequency; sustainability monitors university-enterprise cooperation renewal rate and platform active user growth rate. In terms of evaluation tools, big data automatically collects student training data and enterprise feedback texts; AI technology generates visual evaluation reports (e.g., "professional industry-education integration effect heat map") and identifies weak links (e.g., "insufficient student AI tool application capabilities"), providing data support for universities to adjust training projects and enterprises to optimize cooperation directions. This "data-based evaluation" ensures objective and fair assessment while dynamically

optimizing practical teaching quality, conforming to the concept of evidence-based educational evaluation.

3.4 Regional Characteristic Scenario Implementation: Adapting to Differentiated Needs of Industrial Digitalization

Application-oriented universities, based on regional industrial characteristics, have created a customized practical teaching model integrating "digitalization + industrial attributes" to avoid the homogeneity of "thousands of schools sharing the same model". In provinces with strong manufacturing industries (such as Guangdong and Jiangsu), universities focus on "digital twin + intelligent manufacturing". For example, Dongguan University of Technology has jointly built a "virtual automobile production line" training scenario with local automobile enterprises. Students simulate equipment fault diagnosis and production process optimization, which adapts to the needs of regional intelligent manufacturing positions. In regions with developed service industries (such as Zhejiang and Shanghai), universities emphasize "AI + digital business". For instance, Tianjin University of Finance and Economics has incorporated the enterprise project of "intelligent analysis of listed company financial reports" into the practical course Financial Management, and the analysis reports generated by students are used by enterprises as references for decision-making. In major agricultural production areas (such as Henan and Shandong), universities explore "AI + smart agriculture". For example, the high-clearance autonomous spraying robot developed by Henan Institute of Science and Technology has an unmanned driving function, which can spray pesticides and water-fertilizer without damaging crops. It also has functions such as automatic obstacle avoidance and path planning, applicable to various field crops. This not only improves operation efficiency but also ensures personnel health, serving rural revitalization [6]. This "regionally adapted" model makes digital industry-education integration more in line with local industrial needs, not only delivering precise talents for the region but also enhancing the ability of universities to serve the local economy.

4. Guarantee Mechanisms and Development Paths for Digital Industry-Education

Integration in Application-Oriented Universities

4.1 Multi-dimensional Institutional and Regulatory Guarantee: Consolidating the "Top-Level Framework" for Digital Industry-Education Integration

Regulatory systems serve as the "commanding rod" for the steady advancement of digital industry-education integration, requiring the construction of a "national-local-university" three-level linkage system to clarify development directions and resource support. At the national level, the focus is on "standard guidance," with the issuance of special policies for digital industry-education integration. For example, it regulates technical parameters of digital twin training platforms and security requirements for university-enterprise data sharing, establishes pilot "digital industry-education integration demonstration universities," and provides financial and technical inclinations. At the local level, based on regional industrial characteristics, a mechanism of "special funds + tax incentives" is established. For instance, regional governments offer tax reductions to enterprises participating in cooperation and provide subsidies for universities' digital infrastructure construction. At the university level, internal governance is improved by establishing a "Digital Industry-Education Integration Office" to coordinate project docking, incorporating teachers' participation in digital practical teaching into the bonus items for professional title evaluation, and formulating regulations such as the University-Enterprise Data Security Management Measures to clarify the boundaries of data usage and avoid disputes. The three-level policies form a closed loop of "direction guidance - resource support - implementation norms," solving the dilemma of "no basis for collaboration and no motivation for advancement." [7,8]

4.2 Data Security and Interest Coordination Guarantee: Consolidating the "Core Cornerstone" of Multi-Subject Trust

The core contradiction in digital industry-education integration lies in "unwillingness to share data and difficulty in balancing interests", which requires dual mechanisms to eliminate the concerns of multiple subjects. In terms of data security

guarantee, a system of "technical protection + institutional control + responsibility tracing" is constructed. At the technical level, national cryptographic algorithms are adopted to encrypt data transmission and storage, and hierarchical authorization is implemented based on a role-based access control model. At the institutional level, standardized documents such as the Specifications for Data Lifecycle Management are issued, specifying that data collection requires "informed consent", data usage is limited to teaching scenarios, and data destruction follows the procedures for cooperation termination. At the responsibility level, data operation logs are established, with real-time early warning for abnormal behaviors. In terms of interest coordination guarantee, a "risk-sharing and benefit-sharing" mechanism is designed. Enterprises reduce recruitment costs through "priority talent recruitment rights" and obtain commercial returns through "profit sharing from the transformation of training results". Colleges and universities reduce teaching costs through equipment donations from enterprises and co-built training bases. Students participating in real enterprise projects can obtain labor remuneration and skill certification, forming a win-win pattern where "enterprises gain talents, colleges and universities gain resources, and students gain growth", which effectively improves the traditional situation of "enthusiasm from colleges and universities but coldness from enterprises". [9]

4.3 Digital Teacher and Evaluation System Guarantee: Activating the "Endogenous Motivation" of Practical Teaching

Teachers are the "implementers" of digital industry-education integration, and evaluation is the "calibrator"; both jointly determine the effectiveness of the model's implementation. In terms of teacher guarantee, a system of "hierarchical training + university-enterprise mutual employment" is constructed. At the basic level, training on the operation of AI teaching assistants and virtual training platforms is carried out to address the insufficient ability to apply digital tools. At the advanced level, the focus is on "disciplinary integration," training teachers to integrate digital technologies into professional courses. At the innovative level, "university-enterprise mutual employment" is promoted: colleges and universities select

teachers to participate in digital projects in enterprises, and enterprise technical experts enter campuses to serve as part-time tutors, so as to bidirectionally improve practical capabilities. In terms of evaluation guarantee, a "data-based and multi-dimensional" system is established. Through the platform, student training data and enterprise feedback are collected, and AI generates "student digital skill radar charts" and "professional industry-education integration effect reports" to replace the traditional "paper reports + manual scoring." Enterprises and industry associations are involved in the evaluation; for example, industry associations assess the adaptability of courses in accordance with digital talent standards, ensuring that evaluation results objectively reflect industrial needs and provide precise basis for the optimization of practical teaching [10].

4.4 Regionally Characteristic Development Paths: Promoting the "Precise Implementation" of Digital Industry-Education Integration

A diversified fund investment system should be established to guarantee the sustainable development of digital industry-education integration. At the government level, special guidance funds are set up to subsidize digital infrastructure construction and operation maintenance in stages. Local governments add supporting funds in an appropriate proportion to key fields such as AI + agriculture. Tax incentives are implemented, and industry-education integration development funds can also be jointly established with enterprises and social capital in proportion to leverage the participation of social capital. Enterprises obtain priority rights to talent recruitment by investing in digital training resources in a targeted manner, feed back a certain proportion of technical achievement benefits to colleges and universities, and can charge fees for shared data resources to supplement funds. Colleges and universities allocate a reasonable portion from professional tuition fees as special funds, reduce costs through cross-university co-construction and sharing of platforms, and rely on teachers' technical services and social training income to subsidize projects. In terms of innovating investment and financing models, financial institutions are encouraged to develop special low-interest loans based on the digital projects

under construction. A "government-enterprise-college/university" risk-sharing mechanism is established, input-output evaluations are conducted through third-party assessments, and funds are dynamically inclined to efficient projects. This forms a sustainable cycle of "government lowering thresholds, enterprises obtaining talents, and colleges/universities creating benefits," ensuring the high-quality development of digital industry-education integration.

5. Conclusion

This study systematically analyzes the enabling role of digital technologies in industry-education integration of application-oriented universities, reveals the adaptation limitations of traditional models in digital transformation, and clarifies the upgrading directions of four dimensions: "subject collaboration, resource supply, talent training, and evaluation system." The constructed "one-core, dual-drive, multi-collaboration" new model, supported by the "four-layer and two-middle-platform" technical architecture, realizes precise docking of university-enterprise needs, dynamic sharing of digital resources, virtual-real integration training, and multi-subject collaborative education, effectively solving the pain points of "high cost, high risk" in traditional training and inefficient collaboration. Practice shows that this model can significantly improve the digital practical capabilities and industrial adaptability of application-oriented talents through regulatory guarantee, data security and interest collaboration mechanisms, digital teacher training, and regional characteristic paths. Future efforts should focus on optimizing cross-regional resource collaboration mechanisms and deepening the application of intelligent technologies in personalized training to provide more precise solutions for high-quality development of industry-education integration.

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