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Exploration of the Model and Path of Digitalization Empowering School-Enterprise Collaborative Innovation and Entrepreneurship Education

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Abstract: In the context of the deepening development of the digital economy, the traditional university-enterprise collaborative innovation and entrepreneurship education model in the field of higher education is facing structural contradictions such as inefficient resource integration, loose collaborative mechanisms, and the virtualization of practical teaching. This study reveals the enabling mechanism of digital technology on school-enterprise collaboration and proposes a four-dimensional implementation path of "curriculum system–practice platform–education reform–evaluation system." Digital technology builds a two-way circulation mechanism of knowledge flow between schools and enterprises through the data middle platform, deepens collaborative education by relying on the virtual co-research platform, innovates the ability cultivation paradigm with technologies such as VR/AR, and constructs a dynamic evaluation system using all-dimensional data. Research shows that digital empowerment can break through the temporal and spatial barriers and information asymmetry of the traditional model, improve the efficiency of resource allocation between schools and enterprises, and increase the conversion rate of students' practical projects. In the future, it is necessary to further expand the application of technology in the top-level design of talent cultivation, improve the cross-departmental policy coordination and ethical review mechanism, and provide theoretical and practical paradigms for cultivating high-quality compound talents with data thinking, innovation ability, and industry adaptability in the digital economy era.

Keywords: Digital empowerment; University-enterprise collaboration; Innovation and entrepreneurship education

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1. Introduction

Against the backdrop of the accelerating global digital transformation, the digital economy has become the core engine for reshaping the industrial landscape and driving innovation. Higher education, as the main base for cultivating innovative talents, urgently needs to deepen the integration of industry and education through the school-enterprise collaborative innovation and entrepreneurship education model to meet the new demands

of the digital economy on the structure of talent capabilities [1]. However, under the traditional framework of school-enterprise cooperation, structural contradictions such as fragmented educational resources, loose collaborative mechanisms, and virtualized practical teaching are prominent, resulting in an insufficient fit between talent cultivation and the demands of industrial digital transformation. The iterative development of digital technology provides a new paradigm for solving the above predicament. Big data, artificial intelligence, virtual reality, and other technologies have broken through the temporal and spatial barriers and organizational boundaries of traditional models through the efficiency of information interaction, the flexibility of resource integration, and the immersion of teaching scenarios, promoting the deep integration of knowledge flow, technology flow, and talent flow between schools and enterprises [2]. How to leverage technology to reconstruct the underlying logic of school-enterprise collaboration and build an education model adapted to the digital economy has become a key proposition in higher education reform.

This paper, through current situation analysis and logical deconstruction, reveals the intrinsic mechanism of digitalization empowering school-enterprise collaborative innovation and entrepreneurship education, and proposes targeted implementation paths, aiming to provide theoretical references and practical frameworks for optimizing the talent cultivation system for innovation in the digital age and promoting the transformation of school-enterprise collaboration from "simple resource superposition" to "deep ecological integration."

2. The reality picture and challenges of the school-enterprise collaborative innovation and entrepreneurship education model

In the context of the digital economy reshaping the global education ecosystem, the school-enterprise collaborative innovation and entrepreneurship education model, as the core carrier for cultivating innovative talents, is undergoing a collision and transformation between technological empowerment and traditional mechanisms. This section examines the reality and structural contradictions of the current model from four dimensions: the effectiveness of technology application, breakthroughs in practical innovation, transformation of teaching paradigms, and deep-seated constraints.

2.1. Digital technology's all-domain empowerment and resource reconstruction

Digital technology, through data-driven mechanisms, promotes the transformation of university-enterprise resource allocation from static solidification to dynamic interaction. Universities build cross-organizational resource hubs based on big data analysis and cloud computing architectures to achieve synchronous iteration of teaching content and industrial technologies [3]. Nanjing Tech University, for example, has built a digital course development platform with enterprises, breaking down real projects into modular teaching content to form a closed loop of "industry demand–course design–resource supply," reducing the course content update cycle to six months, improving the matching degree of teaching content with industry demand by 40%, and achieving 82% satisfaction of students with the practicality of the courses [4]. Such practices break down the information barriers of the traditional model, achieve two-way interaction of knowledge flow between the university and the enterprise, and form a trinity synergy of "academic innovation–industrial application–talent cultivation."

2.2. Innovative breakthroughs in the virtual-real integration practice platform

Immersive technologies such as virtual reality (VR) and augmented reality (AR) drive practical teaching to upgrade from simulation to scene reconstruction [5]. Digital practice bases jointly built by universities and enterprises, such as the "research-production-sales" full-chain training platform of Zhejiang University City College,

build virtual production lines through digital twin technology and access desensitized real-time production data of enterprises, allowing students to participate in technological breakthroughs and market expansion in a virtual environment [6]. The data shows that in institutions using such platforms, the completion cycle of students' practical projects has been shortened by 30%, and the conversion rate of innovative solutions has increased by 22%. This dual-track model of "physical space training + digital space rehearsal" effectively reduces the cost of enterprise scenario access and the risk of practice [7].

2.3. Digital transformation and effectiveness of teaching paradigms

Digital technology has driven the transformation of school-enterprise teaching from "knowledge transfer" to "capacity building," giving rise to new models such as project-based learning (PBL) and virtual teaching and research rooms [8]. Through the "enterprise proposition–dual-teacher guidance–student breakthrough" mechanism, the Guilin Finance, Economics and Business Master Workshop has increased the proportion of real business projects participated in by students to 65% and the number of innovative team collaboration achievements to 41%. Virtual teaching and research rooms enable cross-regional joint lesson preparation with the help of online collaboration tools, and flipped classrooms use digital platforms to advance basic knowledge learning and free up class time for practical discussions.

2.4. Deep-seated structural challenges in collaborative education

Despite the remarkable results of technology empowerment, traditional mechanism bottlenecks still restrict deep integration, prominently manifested in three contradictions.

2.4.1. Conceptual cognitive bias leads to shallow empowerment

Some universities equate digitalization with tool updates and fail to incorporate it into the reconstruction of the talent cultivation system. The digital courses in colleges and universities have only achieved the "online transformation of offline content," lacking systematic training of core competencies such as data thinking and the application of digital tools [9]. This misunderstanding of "technical instrumentalization" makes it difficult for digitalization to permeate the core links, such as setting training objectives and reconstructing the curriculum system.

2.4.2. The gap in digital literacy among teachers restricts the in-depth application of technology

Digital teaching requires teachers to have experience in education, technology, and industry, but the proportion of teachers in colleges and universities with the ability of "education + technology + industry" is relatively low [10]. Some teachers, though proficient in basic tools, have difficulty integrating artificial intelligence and big data analysis into teaching, resulting in the application of technologies such as VR/AR remaining at the demonstration level and failing to translate into ability development effectiveness [11].

2.4.3. Fragmentation of collaborative mechanisms hinders resource integration

The cooperation between schools and enterprises mostly remains at a shallow level, such as co-construction of courses and internship bases, and the proportion of enterprises deeply involved in the formulation of talent cultivation plans is relatively low [2]. The lack of an institutionalized collaborative framework has led to enterprises being limited to the role of "resource providers" and teaching content being disconnected from real needs. In addition, problems such as ambiguous ownership of intellectual property rights and the lack of assessment of cooperation effectiveness have restricted in-depth cooperation, such as technology research and development

and project incubation.

3. The internal logic of digitalization empowering school-enterprise collaboration and innovation and entrepreneurship education

The empowerment of school-enterprise collaborative innovation and entrepreneurship education by digital technology is essentially to reconstruct the connection mechanism of educational elements through technology penetration, forming a collaborative education model of "technology-driven–element recombination–ecological evolution." The underlying logic is reflected in the following dimensions.

3.1. Data connectivity: Building a two-way circulation of knowledge flow

Digital technology breaks down the information barriers between schools and enterprises through the "data middle platform" to form a closed loop of knowledge production and application. Universities use big data to analyze enterprises' technological demands to dynamically adjust courses, and enterprises obtain university research results through the platform to accelerate the transformation and achieve the linkage of "academia–industry–education" [12].

3.2. Technology empowerment: Deepening the university-enterprise collaboration mechanism

Digital tools have upgraded school-enterprise collaboration from loose collaboration to ecological collaboration. The virtual co-research platform enables schools and enterprises to develop courses based on digital twin technology, allowing students to participate in the entire process of research and development online with real-time guidance from enterprise engineers; Blockchain technology builds a "dual-teacher resource pool," with enterprise mentors' industrial experiences recorded on the chain and universities precisely matching case teaching resources to keep the cases updated simultaneously [13].

3.3. Cognitive upgrade: A model for cultivating innovation ability

VR/AR technology builds "immersive" learning scenarios (such as "metaverse factories") where students can safely operate industrial equipment and optimize processes; AI analyzes learning data to generate personalized ability paths, enhancing the matching of class projects with abilities; Big data integrates multi-disciplinary knowledge graphs to drive cross-innovation in AI+X [10].

3.4. Scientific evaluation: Dynamic and three-dimensional assessment system

Digital technology builds capability portraits through full-dimensional data collection, and Internet of Things devices generate capability radar charts for collecting behavior data; Embedding enterprise job competency standards (such as Huawei certification metrics) for automated assessment [14].

4. Digital empowerment of the school-enterprise collaborative innovation and entrepreneurship education model

The core of digital empowerment lies in building a closed-loop education system of "demand orientation–resource integration–ability cultivation–evaluation and feedback" through the deep integration of technology and educational elements. This article proposes a systematic approach from the four dimensions of "curriculum,

practice, reform, and evaluation" to promote the transition of school-enterprise collaboration to a digital ecosystem.

4.1. Building a digital curriculum system: Precisely aligning with industrial demands

The digital curriculum system takes industrial demands as the logical starting point and builds a three-dimensional structure of "theory–innovation–practice." The first is the three-dimensional positioning of the training objectives. Colleges and universities need to build a "professional foundation–innovation ability–industry adaptation" capability matrix, strengthen digital basic knowledge such as data science, cultivate the ability to break down problems and integrate across disciplines, and align with regional pillar industries. The second is the ecological reorganization of the curriculum content. Break down disciplinary boundaries, build a system of "core course clusters + dynamic modules," offer "AI + X" cross-disciplinary courses, and invite enterprise experts to participate in the compilation of teaching materials; Use big data to monitor industry trends and update 10–15% of the content every semester; Set up a compulsory course on "Innovation and Entrepreneurship practice," requiring the completion of real enterprise propositions. The third is the immersive innovation of teaching methods. Use VR to build "metaverse classrooms," AI to generate personalized "ability enhancement white papers," and blockchain to store "digital learning archives" to enhance teaching effectiveness.

4.2. Building digital practice platforms: Connecting the entire chain of innovation

The practice platform builds a three-level system of "virtual within the school–real in enterprises–social entrepreneurship." The first is the digital upgrade of the industrial base. Schools and enterprises jointly build "smart plus" bases, introduce digital twin production lines, and access real-time production data of enterprises. Ecosystem construction of business incubators. The second is to build a "creative screening–resource matching–process management" platform, using NLP technology to analyze business plans, intelligently matching policies, technologies, and financial resources, and using blockchain to record progress. Third, digital empowerment of the innovation and entrepreneurship competition. The competition adopts a "metaverse competition + big data review" model, with contestants presenting virtual scenarios and the system capturing patent and user data to generate evaluation reports.

4.3. Deepening digital education reform: Innovating industry-education integration mechanisms

Solve the contradiction of coordination through institutional innovation and establish a long-term mechanism. The first is the regional industrial connection mechanism. Establish "university-government-enterprise" industrial research institutes and release the "White Paper on Regional Industrial Talent Demand" quarterly; Use machine learning models to predict talent gaps and make dynamic adjustments to professional layouts. The second is the improvement of the "dual-qualified" faculty. Implement the enterprise practice system for teachers, stipulating that more than six months of practical experience accumulated every five years will be included in the evaluation of professional titles; Carry out stratified training on "basic tool application–data-driven teaching–intelligent technology innovation"; Promote "1+1" dual-teacher collaborative teaching. The third is the joint governance structure of schools and enterprises. Establish an "Innovation and Entrepreneurship Education board" to review the annual plan, monitor progress through a digital platform, and clarify the distribution of intellectual property rights.

4.4. Improving the digital evaluation system: Scientific and three-dimensional assessment capabilities

Build a system of "multi-dimensional indicators–full-cycle data–intelligent application." The first is the design of diversified indicators. Establish three levels of indicators: The first-level indicators are professional (40%), innovation (30%), and industry adaptation (30%) capabilities. The second-level indicators include digital tool application, problem definition, etc. The third-level indicators are quantified down to programming proficiency, etc., and the platform collects data automatically. The second is multi-agent collaborative evaluation. Universities analyze the "Personal Ability Development Curve," enterprises record internship performance through systems, and introduce industry certifications. The third is the intelligent application of evaluation results. AI generates suggestions for enhancing capabilities, recommends courses and projects, intelligently matches job positions, and provides feedback on educational quality.

5. Conclusion and prospects

This study reveals the bottlenecks of traditional school-enterprise collaborative innovation and entrepreneurship education in terms of resource integration and practical teaching, clarifies the internal logic of digital technology through data integration, collaborative deepening, cognitive upgrading, and scientific evaluation, and constructs a four-dimensional empowerment path of "curriculum system–practice platform–education reform–evaluation system." The study shows that digital empowerment can optimize the allocation of resources between schools and enterprises, promote the innovation and upgrading of the education model, and enhance the efficiency of collaborative education.

In the future, it is necessary to further deepen the application of digital technology in the top-level design of talent cultivation, improve the cross-departmental policy coordination and data security governance mechanism, and explore the path of cross-border school-enterprise cooperation and educational equity. At the same time, digital education ethics review should be strengthened to ensure the standardization and humanistic nature of technology application. The research aims to build a more resilient ecosystem of collaborative education between schools and enterprises through continuous technological iteration and institutional innovation, providing high-quality talent support for the development of the digital economy.

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References

[1] Zhu Z, Hu J, 2022, Digital Transformation of Education: An Epoch-Making Paradigm Shift in Education. China Education Policy Review, (01): 3–21.

[2] Wang D, 2024, Research on the Digital Construction of Innovation and Entrepreneurship Education Curriculum

System in Local Colleges and Universities. Education Theory and Practice, 44(30): 14–18.

[3] Gao Y, 2025, Thoughts and Countermeasures for the Development of Digital Construction in Higher Education Institutions. Beijing Education (Higher Education), (02): 25–27.

[4] Hu Y, Fu C, 2025, Exploring a New Path of Practical Education for Innovation and Entrepreneurship with "Diversity" Integration in Universities under the Background of New Engineering: A Case Study of the School of Mechanical Engineering and Power Engineering of Nanjing Tech University. Journal of Multimedia and Network Teaching in China (Upper Month), (03): 132–135.

[5] Jin X, Wang M, Tian W, 2023, Exploration of a Virtual-Real Integration School-Enterprise Collaborative Practice Platform for Gold Courses. Journal of Higher Education, 9(06): 93–96.

[6] Han L, Fang B, Tian J, 2024, An Innovative Model of Talent Cultivation for School-Enterprise Cooperation Based on Full-Chain Digital Empowerment. Journal of Higher Education, 10(30): 69–73 + 77.

[7] Fang F, 2025, Innovative Path for the Construction of Virtual Teaching and Research Rooms for School-Enterprise Cooperative Courses. Journal of Jiamusi Vocational College, 41(05): 199–201.

[8] Zhao L, Feng Y, Guo L, et al., 2025, Construction of a Practical Platform for Automation Major Based on Robots under the Background of New Engineering. China Modern Educational Equipment, (07): 61–63.

[9] Zhou H, Li D, Guo W, 2024, The Spatial Logic of Digital Transformation in Higher Education. China Higher Education Research, (10): 27–35.

[10] Zhang H, Han X, Wang X, 2025, A Study on a New Paradigm of Innovation and Entrepreneurship Education in Colleges and Universities in the Context of the Digital Age. Journal of Social Sciences of Jiamusi University, 43(04): 133–135.

[11] Jiang J, Huang H, Qiu Y, et al., 2025, Research on the Construction and Practice of the Curriculum System of Innovation and Entrepreneurship Education under the "Five-in-One" Model. China Construction, (05): 57–59.

[12] Gong L, Wang S, Zhang Z, 2024, Research on the Innovative Mechanism of Customized Talent Cultivation Model in the Context of University-Government-Enterprise Cooperation: A Case Study of Shandong Province. China-Arab States Forum on Science and Technology (Chinese and English), (04): 133–137.

[13] Chen C, Li H, 2024, Digitalization Empowering the Construction of an Innovation and Entrepreneurship Education Ecosystem: Value, Logic and Path. Higher Engineering Education Research, (03): 187–193.

[14] Huang L, Yang Y, 2024, Innovation and Entrepreneurship Education Ecosystem in Colleges and Universities: System Structure, Dilemmas and Optimization. Heilongjiang Higher Education Research, 42(08): 147–153.