

# **Teacher-Student Collaboration Empowers Rural Micro-and Small Enterprises: A Study on Collaborative Governance Paths of Higher Vocational Colleges Serving Rural Revitalization**

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**Abstract:** Against the backdrop of the full implementation of the Rural Revitalization Strategy and the new stage of industry-education integration moving towards symbiosis and win-win results, how higher vocational colleges can break through the predicament of traditional social service models and effectively empower rural micro-and small enterprises (MSEs) with scattered layouts and diverse needs has become a core issue with both theoretical value and practical urgency. Based on the collaborative governance theory, this study constructs a "Context-Actor-Process-Outcome" analytical framework. Through an in-depth case study of a higher vocational college in Wencheng County, Zhejiang Province, it systematically explains the operational logic and practical effectiveness of the new empowerment path of "teacher-student collaboration". The research finds that the "collaborative action unit" composed of teachers and students can effectively adapt to and integrate into the fragmented economic and social ecology of rural areas by building a four-in-one operational mechanism including dual internal drive, flexible access, project embedding, and network symbiosis. This model not only organically integrates teaching processes, scientific research exploration, and social services, realizing a fundamental transformation from traditional skill training to providing high-value-added technical services, but also plays a substantive governance role in optimizing rural production space, empowering local cultural subjects, and constructing localized collaborative networks through specific project practices. This study reveals that "teacher-student collaboration" serves as a key action hub linking the macro industry-education integration strategy with micro enterprise needs and effectively integrating into local governance networks. It provides a

replicable path paradigm for similar colleges to serve rural revitalization and offers important enlightenment for deepening the type characteristics of vocational education and reconstructing the symbiotic relationship between colleges and local communities.

**Keywords:** Rural Revitalization; Higher Vocational Colleges; Teacher-Student Collaboration; Collaborative Governance; Industry-Education Integration.

## **1. Introduction**

Rural revitalization is the solid foundation for realizing Chinese-style modernization, and its core driving force lies in the comprehensive revitalization of rural industries. Scattered across rural areas, micro-and small enterprises (MSEs) are important carriers for absorbing employment, activating the economy, and inheriting local culture. Their high-quality development is directly related to the effectiveness of rural revitalization. However, practical problems such as slow technological iteration, extensive management methods, lack of professional talents, and insufficient innovation capacity generally restrict their transformation and upgrading process [1]. Meanwhile, the reform of national vocational education continues to deepen, and industry-education integration has entered a new stage characterized by building an ecosystem integrating the education chain, talent chain, industrial chain, and innovation chain [2]. This puts forward higher requirements for the social service capacity of higher vocational colleges, shifting from passive cooperation to active leadership and from simple resource exchange to in-depth value co-creation[3]. Nevertheless, a profound structural contradiction has become increasingly prominent. The current mainstream industry-education integration models are mostly designed and operated on the premise of relatively concentrated service objects, standardized needs, and standardized

cooperation interfaces [4]. When facing the unique ecology of rural MSEs, such as scattered layouts, small scales, weak technical foundations, and highly heterogeneous needs, these models often struggle to adapt. They are manifested in high transaction costs, difficulty in precise delivery of service supply, and unsustainable cooperative relationships due to fragmented needs [5], ultimately leading to the suspension of service resources of higher vocational colleges in rural areas. Concurrently, higher vocational colleges themselves have a path dependence in their social service capacity. A large number of service activities are still concentrated in low-value-added non-academic training, and their capacity to provide high-value-added services that can solve core technological and process problems of enterprises is obviously insufficient, showing an overall characteristic of "weak intellectual service" [6].

Therefore, the core question that this study aims to explore is: In the specific, complex, and differentiated practical field of rural revitalization, can higher vocational colleges construct an innovative path that can respond to the fragmented and scattered needs of MSEs in a low-cost, high-flexibility, and precise manner, while simultaneously realizing the training of high-quality technical and skilled talents and the expansion of social service functions? What are the inherent operational logic and collaborative governance mechanisms of this path?

To answer the above questions, this study introduces "teacher-student collaboration" as the core analytical unit and innovative mechanism. This paper defines "teacher-student collaboration" as a project-based action community composed of teachers and students based on clear common goals, driven by both internal institutional incentives and endogenous motivation within higher vocational colleges. It addresses real industrial problems in rural areas and possesses high operational initiative and continuous learning capacity. This community is not only the smallest effective allocation unit of educational and teaching resources but also an active cell that can take the initiative to embed into rural social networks and activate local resources. This study selects a vocational and technical college in Wencheng County, Zhejiang Province, which has formed a mature model and achieved remarkable results in serving local MSEs, for an in-depth case study. It aims to systematically reveal how the teacher-student

collaborative empowerment model can effectively overcome the obstacles of traditional industry-education integration and carry out its governance practices in specific county contexts, thereby providing a new paradigm with both theoretical depth and practical validity for higher vocational colleges to serve rural revitalization with high quality.

## **2. Literature Review and Analytical Framework Construction**

The theory and practice of industry-education integration have undergone profound evolution. Early studies, based on resource exchange theory, regarded university-enterprise cooperation as a transaction of complementary resources [7]. With the deepening of practice, scholars began to pay attention to institutional construction, proposing that industry-education integration must move towards the institutionalization of university-enterprise relationships, ensuring the sustainability of cooperation through stable governance structures and benefit-sharing mechanisms. Current research has entered a new stage of ecosystem and digital empowerment, emphasizing the construction of an organic system integrating the education chain, talent chain, industrial chain, and innovation chain, and pursuing the ecological value of symbiosis and win-win results [8-9]. However, this macro paradigm emphasizing institutionalization and systematization faces significant challenges when implemented in rural areas. The rural industrial ecosystem is fragile. As the main body, MSEs are characterized by fragmentation, non-standardization, and strong resource constraints, making it difficult for them to directly access the preset ecosystem framework as equal nodes. Their occasional, fragmented, and highly contextualized needs cannot support the stable resource exchange flow required by large-scale cooperation platforms, easily leading to institutional idleness or service suspension [10]. Digital transformation is not a simple technical addition but profoundly changes the operational mechanism of industry-education integration through "data-driven" and "platform interconnection", transforming it from traditional linear collaboration to networked and intelligent ecological collaboration [11].

The improvement of the social service capacity of higher vocational colleges is a direct manifestation of serving rural revitalization. Existing studies have pointed out that there is a

significant capacity lock-in in the current social services of higher vocational colleges, with weak horizontal scientific research cooperation, low conversion rate of intellectual property rights, and service content still trapped in the traditional training path, essentially failing to get rid of the inertia of weak intellectual service [12]. Studies call for a shift to "five-tech" services centered on technology development, transfer, licensing, consulting, and services to achieve strong intellectual output. The key to realizing this transformation lies in activating the micro-innovation subjects within higher vocational colleges. Existing studies mostly regard schools or colleges as overall actors, ignoring the most dynamic knowledge production and transformation units within them. The teacher-student collaborative unit is precisely the ideal form of such a micro-carrier. It is small in scale, highly flexible, and has both educational and social attributes, enabling it to penetrate deeply into the terminal of rural space and interact directly with multiple subjects through projects [13]. The operation of this unit not only provides services but also specifically participates in the collaborative solution of local problems and the construction of support networks.

Collaborative governance theory provides an appropriate theoretical perspective for analyzing the teacher-student collaboration model [14]. This theory emphasizes that for complex public issues, multiple stakeholders make collective decisions and take actions by establishing rules, structures, and processes to achieve goals that cannot be achieved by a single organization. In the context of this study, the sustainable development of rural MSEs is a public issue. Higher vocational colleges, local governments, MSEs, industry associations, farmers, and other parties constitute multiple actors, with the goal of realizing the multiple values of enterprise empowerment, talent training, and regional revitalization through collaborative actions. Based on this, this study constructs a dynamic "Context-Actor-Process-Outcome" analytical framework to systematically explain the internal logic of the teacher-student collaborative empowerment model.

This analytical framework reveals the complete logical chain of teacher-student collaboration empowering rural MSEs. The framework starts with a systematic response to the specific complex and fragmented rural context, which includes characteristics such as geographical

dispersion, fragmented needs, strong resource constraints, and dense social networks. At the actor level, the teacher-student collaborative unit is activated as the core action engine, with its driving force derived from the dual construction of institutional incentives and individual identity. At the process level, it unfolds as a continuous cycle of interaction among four key links: the initiation of dual internal drive, the perception of flexible access, the response of integration of learning and doing, and the support of local integration. These links are not linearly advanced but form an organic whole that is mutually nested and dynamically adjusted. Finally, this collaborative process produces the result of multiple value symbiosis, which is specifically manifested in multiple dimensions such as improved enterprise efficiency, the development of students' abilities, teachers' professional growth, strengthened community networks, and accumulated social reputation of colleges. Particularly importantly, these results are not the end but continuously strengthen the initial driving force and optimize the entire process through feedback mechanisms, forming a self-reinforcing and continuously evolving governance loop. This framework provides clear theoretical guidance for the case analysis of this study and also reveals the structural function of teacher-student collaboration as a meso-mechanism in linking macro strategies with micro practices and integrating educational logic with industrial logic.

### **3. Research Design and Case Background**

This study adopts an exploratory embedded single-case study method [15]. This method is particularly suitable for exploring process-oriented "how" and "why" questions, enabling a holistic and thick descriptive understanding of phenomena and their specific contexts. The case selection follows the principle of theoretical sampling. A vocational and technical college in Wencheng County, Zhejiang Province, has long adhered to the school-running orientation of taking root in the county and serving micro-and small enterprises. Its systematic and organized teacher-student collaborative social service practice has been in operation for more than two years, accumulating rich successful projects, systematic institutional documents, extensive social reputation, and valuable practical experience. It can be called a typical and enlightening case for studying this phenomenon.

To ensure the reliability and validity of the research, the data collection adopts the triangulation method. Specifically, it includes three levels: first, in-depth interviews. Semi-structured in-depth interviews were conducted with 42 people, including college administrators, project supervisors, participating students, benefited MSE owners, and responsible persons of relevant local departments, to obtain qualitative data from multiple perspectives; second, document analysis. Systematic review of the college's social service annual reports, talent training quality annual reports, full-cycle documents of typical projects, teaching management and incentive system documents over the past three years; third, participant observation. Conducted a four-month field observation of two teacher-student teams serving the upgrading of agricultural product e-commerce and the digital transformation of traditional crafts, respectively, recording their work processes and interaction details. Data analysis adopts pattern matching and thematic analysis methods, iteratively comparing and refining empirical data with the theoretical framework to abstract core categories and mechanisms with explanatory power.

The case location, Wencheng County, has distinct characteristics of a mountainous county economy, with ecological tourism, intensive processing of characteristic agricultural and sideline products, and bamboo and wood craft manufacturing as the leading industries. There are more than 2,000 registered MSEs in the county. These enterprises generally face practical difficulties such as low product added value, backward production technology, weak brand influence, and narrow sales channels. They have strong and urgent needs in technological innovation, process improvement, digital marketing, and cultural tourism integration design. However, limited by enterprise scale, capital strength, and technical foundation, they are often unable to bear the high service costs of market-oriented professional institutions, nor can they establish stable cooperative relationships with large universities or scientific research institutes. This contradictory situation of coexisting high demand density and low payment capacity, as well as the coexistence of technical hunger and lack of docking channels, has precisely provided a unique living space and development soil for the teacher-student collaborative service model

characterized by low cost, high flexibility, and strong effectiveness.

#### **4. Operational Mechanism of the Teacher-Student Collaborative Empowerment Model**

Practice in Wencheng County shows that the teacher-student collaborative empowerment model is a systematic governance mechanism that self-organizes, evolves, and dynamically adjusts in the complex rural context. Its operational logic can be decomposed into four closely connected and cyclically enhanced core links, which together form a complete value creation and transmission chain. These links not only succeed each other in time sequence but also support each other in logic, forming a micro-governance ecosystem with high adaptability and vitality. An in-depth analysis of the internal composition, operational logic, and coupling relationship between each link is the key to understanding the effectiveness of this model.

##### **4.1 Dual Internal Drive Activation System**

The fundamental motivation for teachers and students to continuously engage in service projects comes from a well-designed dual internal drive system. This system profoundly reflects the assertion of collaborative governance theory that "initial conditions" and "mutual trust" are crucial for initiating cooperation [16]. For teachers, the driving force is complex and multi-dimensional, and has been institutionally reshaped. The college has carried out profound evaluation reforms, taking the amount of lateral technical service funds received, typical cases of solving practical enterprise problems, and the effectiveness of achievement transformation such as patents as core indicators for professional title evaluation, post appointment, and performance distribution, with a weight of no less than 40%. This measure has completely reversed the traditional academic orientation of emphasizing vertical papers over horizontal services, directing teachers' intellectual contributions to the front line of industrial practice [17]. Successful service projects can be naturally transformed into materials for provincial high-quality online open courses, awards in provincial teaching ability competitions, and municipal and prefectural-level applied scientific research projects, realizing a virtuous cycle and value mutual feeding of teaching, scientific research, and

social services. The college also sets up a special "Social Service Contribution Award" to commend advanced teams and individuals every year, with substantial performance rewards, creating a strong organizational culture of "serving with achievements and contributing is honorable".

For students, the driving force is also diverse and attractive, reflecting a "process-oriented" incentive design. In-depth participation in projects and passing assessments can be recognized as 2 to 4 innovative practice credits, partially replacing credits of relevant professional courses, realizing flexible certification and diversification of learning outcomes. Project experience and achievements have become practical resumes highly favored by enterprises in job hunting. Especially in provincial and above vocational skills competitions, students with real project experience show significant competitive advantages [18]. More importantly, in the process of solving real industrial problems, students have achieved substantial improvements in professional sense of accomplishment, complex problem-solving ability, and team spirit, as well as a sense of value identity for making visible contributions to hometown construction, which constitutes a strong and lasting endogenous incentive. This incentive structure transforms students from passive "containers" of knowledge into active "actors" who explore and create value, and their subjectivity is fully stimulated.

Driven by this system, "double-qualified teachers" with rich enterprise practical experience or specific technical expertise take the initiative to act as initiators and project managers. Like keen "industrial scouts", they issue project recruitment notices to the whole college around potential service areas such as agricultural product e-commerce operation, digital design of bamboo and wood crafts, intelligent transformation of homestays, and improvement of traditional food processes. The recruitment process emphasizes two-way selection and interest matching, selecting students from different grades and majors to form teams through interviews. For example, a project team aiming to provide "smart cultural tourism" solutions for mountain homestay clusters has gathered students from four majors: hotel management, software technology, digital media, and environmental art, forming a micro-

interdisciplinary workshop. This formation mechanism based on consensus and complementarity ensures the consistency of team members' goals, the rationality of ability structure, and the effectiveness of operational collaboration, laying a solid organizational foundation and driving force for subsequent in-depth services from the source. Teachers' professional authority, industry experience, and students' innovative vitality and native digital capabilities are organically combined in this process.

#### **4.2 Flexible Access and Perception System**

Different from the traditional service method of passive waiting, the teacher-student collaborative unit takes the initiative to build a three-dimensional and high-flexible demand perception and response network. This system is a strategic adaptation to the characteristics of "invisible needs" and "fragmented distribution" of rural MSEs. Its operational channels present a four-dimensional complementary pattern, ensuring comprehensive coverage and accurate capture of scattered and invisible needs, fully reflecting the principles of "inclusive participation" and "face-to-face dialogue" in collaborative governance [19].

Firstly, the institutional interface of government-university collaboration. The college has established a "Enterprise Service Liaison Station" in conjunction with relevant county departments, holding regular joint meetings to summarize, sort out, and form an official "Enterprise Technical Demand List". This list has become a stable and authoritative source of demand information for teacher-student teams. Secondly, the informal penetration of social capital. Through serving as technical consultants of industry associations, participating in alumni association activities, and contacting local villagers with outstanding achievements, teachers are deeply integrated into local informal information networks and social relations, enabling them to capture hidden enterprise pain points, potential business opportunities, and cooperative invitations based on human trust that are not included in the official list. Thirdly, proactive field reconnaissance. The college organically combines social services with talent training, and institutionally organizes teacher-student teams to carry out large-scale county industrial "surveys" during winter and summer vacations. The teams conduct carpet-style

interviews and participant observations in industrial parks, agricultural cooperatives, and family workshops, interviewing more than 200 enterprises annually, and forming a first-hand and dynamic "rural industrial demand map" and "enterprise file database". This "measuring with feet" method enables the team to discover those small needs that are not well expressed or do not know where to seek help. Finally, regular online and offline "diagnostic" services. The college sets up a physical "Technical Service Station" and an online "Cloud Consultation Platform" to provide regular on-site consultation and online Q&A; at the same time, it organizes 2-3 "Technical Service Teams" to carry out centralized inspections in key towns and villages every month, delivering services to the door and changing "enterprises running" to "teachers and students running".

After perceiving potential needs, the teacher-student unit does not rush to provide standardized solutions but conducts multiple rounds of low-cost and informal in-depth communication and co-diagnosis with enterprises. This process is crucial. It goes beyond simple demand collection and rises to the joint construction of problems. For example, in response to the vague and superficial appeal of a bamboo and wood processing factory owner that "product profits are low and sales are poor", the teacher-student team did not directly promise to provide design solutions but first stationed in the factory for three days, adopting an "immersive work method": observing the entire process from raw material processing to finished product packaging, calculating the material, labor, and energy costs of each link, and interviewing front-line workers, salespersons, and management. Through this in-depth interaction, the team and the factory owner jointly redefined the original pain point as "developing a modular furniture design manual based on the mechanical and aesthetic characteristics of local specific bamboo materials, suitable for small-batch and flexible production in micro-workshops, and a supporting simple process optimization plan". This process of "jointly defining problems" not only accurately anchors the service target, avoiding supply-demand mismatch and resource waste caused by unclear problem definition but also establishes a trust relationship based on professional understanding and emotional resonance through repeated interaction, listening,

and respect. It greatly reduces the start-up cost, trial-and-error cost, and psychological threshold of cooperation, reflecting deep respect and adaptation to the decision-making habits, realistic resource constraints, and cultural context of rural MSE owners. The essence of this "flexible access" is to establish an equal and dialogical partnership, which is a key prerequisite for services to truly "sink down", "stick", and produce practical results.

#### **4.3 Learning-by-Doing Response System**

Project implementation is the core link of teacher-student collaboration to create multiple values, perfectly interpreting the integrated educational philosophy of "service is learning, and learning is service", and is also the concentrated embodiment of "commitment process" and "shared results" in collaborative governance. Its operation follows the principle of "teacher-led, student-centered, and iterative advancement", transforming real and complex industrial problems of enterprises into a series of related and contextualized learning tasks and research projects, realizing the unity of knowledge application, skill training, literacy improvement, and value creation in action.

In the entire process, teachers play multiple roles as technical directors, quality officers, learning mentors, and relationship coordinators. They are responsible for the strategic design of the overall framework of the plan, the control of key technical routes, external coordination and communication, as well as quality supervision and risk control throughout the project implementation. Their experience ensures the professional bottom line and feasibility of the project. The student team, as the main force of project implementation and the source of innovative vitality, undertakes specific tasks such as market research, data collection and analysis, program creative design, prototype production and testing, cost-benefit simulation, and communication and reporting in groups under the "scaffolding" support built by teachers. The team adopts a project management rhythm similar to agile development, holding weekly project meetings to report progress, reflect on difficulties, conduct collective discussions, and dynamically adjust plans, forming a highly autonomous, closely collaborative, and rapid iterative work culture.

This process is full of trial and error, iteration, and creative breakthroughs, which is an

excellent exercise for students' ability to solve complex problems. In a typical project of product innovation and market expansion for a rural micro-workshop specializing in bamboo and wood crafts, students majoring in intelligent manufacturing are responsible for analyzing the limitations of existing manual tools and designing low-cost and easy-to-operate semi-automatic auxiliary equipment to improve carving accuracy and production efficiency; students majoring in design deeply explore local bamboo cultural images and intangible cultural heritage elements to carry out product shape innovation, serialized development, and brand visual system design containing local narratives; students majoring in e-commerce and marketing are responsible for building an online display and sales system, and producing visual content and marketing copy reflecting the craftsmanship. Under the collaborative guidance of teachers, the solution proposed by this interdisciplinary team has undergone five rounds of difficult iterations in the real production and market environment of the workshop: the first round of the plan was rejected due to the high cost and complex operation of the introduced CNC carving equipment; in the second round, when testing self-made auxiliary tools, it was found that there were problems of unstable accuracy and limited efficiency improvement when processing specific curved bamboo materials; although the product series designed in the third round had a modern sense, it failed to gain emotional recognition from potential consumer groups in terms of the ecological texture and cultural expression of the packaging; the online marketing content planned in the fourth round failed to effectively convey the temperature and unique story of hand-made products; it was not until the fifth round that the team finally achieved a delicate balance between technical feasibility, cost controllability, market acceptance, and cultural value transmission by integrating and improving simple mechanical fixtures, optimizing tool paths, using local environmentally friendly materials for packaging, and closely linking the entire brand narrative to the themes of "new life of bamboo rhyme" and "youthful craftsmanship". This continuous exploration, feedback, and innovation under real market and technical constraints not only produced a feasible upgrade plan—increasing the added value of the workshop's main product line by about 35% and achieving significant

sales growth through the development of new channels—but also enabled students to experience in-depth practice and comprehensive ability training far beyond the simulated scenarios of traditional classrooms in terms of interdisciplinary knowledge integration, lean manufacturing thinking, user-centered design, cost-benefit analysis, and cultural and creative transformation.

The value of project results has achieved efficient multiple transformation and appreciation, forming a virtuous cycle of "killing multiple birds with one stone". Firstly, technical solutions and design results directly respond to the workshop's upgrading needs, bringing considerable economic benefits and improved brand influence. Secondly, the research data, design plans, implementation records, and review reflections throughout the project are systematically refined and reconstructed into core teaching modules and loose-leaf textbooks for the school-based core course "Innovation and Brand Transformation of Traditional Handicrafts" or related professional courses, serving the training of a wider range of students. Thirdly, based on the innovative improvement of traditional tools, new product structures, or packaging designs, the teacher-student team jointly applies for utility model patents or design patents, and publishes case study papers on the project model and collaborative mechanism of "micro-workshop innovation empowerment". Finally, the complete process and remarkable results of the project from diagnosis and design to implementation have become high-quality materials and sources of competitiveness for teachers and students to participate in teaching ability competitions and innovation and entrepreneurship competitions. It has truly realized the "four-in-one" of social service output, high-quality teaching resource generation, applied scientific research achievement incubation, and improvement of teachers' and students' competition results, fully demonstrating the strong effectiveness of teacher-student collaboration as a hub for knowledge production, transformation, and diffusion. This system organically integrates the three major functions of higher vocational colleges—talent training, scientific research, and social services—at the micro-project level and achieves synchronous resonance.

#### **4.4 Local Integration Support System**

The teacher-student collaborative unit deeply understands that effective operation in the rural field must not be limited to simple technical problem-solving. It must take the initiative to act as a social connector, resource catalyst, and network weaver, actively constructing and deeply integrating into a localized collaborative governance and support network. Based on trust, mutual benefit, and common goals, this network greatly extends the capability boundary and social capital radius of a single teacher-student team. It is the key to coping with systematic and chain-like industrial challenges, and also a vivid practice of "intermediate outcomes" and "institutional design" in collaborative governance theory [20].

Firstly, the team attaches great importance to positive interaction and strategic alignment with grass-roots organizations, seeking "project compliance" and resource support. Before the start of each project, the team will take the initiative to visit relevant leaders, village cadres, and responsible persons of relevant stations in the project location, detailedly report the project plan, expected results, and required support, deeply understand local industrial policies, annual work priorities, and resource layout, and strive to embed the project into the local government's governance agenda and development plan. For example, a student team designing an "intangible cultural heritage craft experience workshop" for a key rural tourism village took the initiative to connect with the village committee at the initial stage of the project, closely integrating the project plan with the village's ongoing application for the creation of a "beautiful and livable demonstration village" and the development goal of "cultural tourism integration". Their active communication and professional plan won the trust and support of the village committee. The village committee not only provided idle old houses in the village as temporary workshop venues, assisted the team in coordinating the participation of local craftsmen but also included the project as a key content of the village collective's external publicity. This enabled the student team to quickly obtain key local knowledge and social capital support at a very low start-up cost, significantly improving the feasibility and local integration of the project.

Secondly, the team is good at identifying, linking, and activating local industrial organizations and social forces to form the

promotion, diffusion, and ecological catalytic effect of service results. Instead of serving individual enterprises in isolation, they consciously push point-like services to linear and surface-like impacts. By linking with the county rural tourism cooperative, the intelligent tour guide and cultural experience solutions designed for homestays are integrated into the cooperative's unified marketing platform and high-quality tourism routes, enhancing the attractiveness of individual homestays and improving the overall value of the regional tourism brand.

Furthermore, the college has established a strong cross-professional "background expert database" and resource scheduling support mechanism, providing a solid "rear base" for front-line teacher-student teams. When the team encounters complex problems beyond their existing knowledge structure and technical capabilities during project implementation, they can initiate an "expert consultation" application process. Based on the nature of the problem, the college matches and invites teachers in relevant fields from the on-campus or cooperative unit expert database to provide targeted guidance. For example, a student team helping local homestays optimize online operations and customer experience encountered difficulties such as "fluctuating content communication effects" and "vague customer portraits" when trying to conduct social media content drainage and data analysis. After the team applied for support through the platform, the college coordinated teachers in digital media marketing, tourism management, and statistics to form a temporary guidance group. The experts guided the student team to use simple A/B testing methods to compare different content strategies, use basic customer feedback tools for data collection and visualization analysis, and re-sort out the core experience labels of the homestay. With the experts' guidance, the team not only quickly found a more effective content direction and customer touchpoints but also their completed "Homestay New Media Operation Optimization Plan" was detailed in data and clear in logic, and was adopted by the local cultural and tourism department as a reference case for the improvement of micro-accommodation formats, upgrading the project from a simple practical assignment to a normative achievement with regional promotion value and realizing the leap of project influence.

The strategic value of this localized collaborative network is particularly reflected in its strong resource leveraging and industrial ecological catalytic capabilities. The subsequent development of a student team that initially only provided "online display optimization" services for a family homestay vividly interprets the multiplier effect of networked collaboration. The team was initially led by teachers majoring in tourism management and implemented by students majoring in e-commerce. The task was only to help the homestay take photos, write introductory copy, and put it online on mainstream booking platforms. However, during the work process, the team keenly discovered that the ancient village where the homestay is located has many underdeveloped traditional style landscapes and handicraft resources.

Based on this discovery, the team took the initiative to expand the scope of services. Firstly, teachers and students majoring in tourism management were responsible for in-depth exploration of the village's historical culture and designed a "micro-vacation" themed route integrating accommodation, sightseeing, and manual experience. Subsequently, they took the initiative to connect with the town's cultural and tourism office with this plan, successfully included this route in the town's tourism promotion manual, and helped the homestay obtain the logo of "designated reception unit". At the same time, teachers and students majoring in e-commerce did not stop at the online operation of the individual homestay. They helped the homestay owner open a short video account, created content under the theme of "the homestay host takes you to tour the ancient village", and linked to sell villagers' bamboo weaving, hand-woven cloth, and other handcrafted products.

This series of actions produced a chain reaction: the town's cultural and tourism office, seeing the actual effect, introduced more interested homestays to the team; local craftsmen were more willing to participate in tourism experience links because their products had new sales channels; a local small travel agency included this themed route in its product list. In the end, this project with a small starting point catalyzed the formation of a "cultural tourism micro-ecology prototype" with the homestay as the initial node, gradually linking multiple surrounding homestays, hand workshops, characteristic scenic spots, and travel agencies.

This practice of taking a professional entry point, taking the initiative to connect upstream and downstream resources, upgrading simple technical services to format integration planning, and then leveraging administrative and market resources vividly reflects how the teacher-student collaborative unit, with a small initial investment, activates and connects scattered resources by building network nodes, thereby addressing the systematic problems required for rural cultural tourism development. Therefore, the team has also transcended the initial role of service contractor and become the initial builder and key connector of the local industrial ecology.

### **5. Theoretical Dialogue and Model Implications**

Based on the in-depth practice in Wencheng County, the teacher-student collaborative empowerment model can be refined as: under the guidance of the macro industry-education integration ecosystem strategy, a micro-governance hub active at the rural grassroots level, with self-organization, self-adaptation, and self-growth capabilities. With the dual internal drive system as the endogenous power source, the flexible access network as the environmental perception interface, the learning-by-doing response as the core value engine, and the local integration network as the external resource support, this hub efficiently and agilely completes the precise matching and value transformation of knowledge, technology, talents, and the fragmented needs of rural industries. Its innovation is prominently reflected in three levels: at the actor level, it establishes the teacher-student collaborative unit as a key micro-actor with independent initiative in industry-education integration research, breaking through the traditional analytical paradigm that regards colleges as homogeneous "black boxes" or only focuses on the binary opposition between schools and enterprises; at the path level, it provides a lightweight, agile, and high-penetration service new path different from the heavy-asset and large-platform model, offering an economically feasible and resilient new idea for rural industrial empowerment under resource constraints; at the process level, it deeply reveals the process mechanism and realization carrier of the synchronous resonance and internal unity of social services, talent training, and applied scientific research, proving that high-quality social services themselves are the most effective

practical teaching and the most down-to-earth applied scientific research.

The conclusions of this study form a constructive dialogue and expansion with existing literature. Firstly, it provides an important procedural supplement to the theory of institutional construction of industry-education integration. Mainstream research emphasizes the establishment of a stable university-enterprise community of shared destiny through formal contracts, governance structures, and top-level design [11]. However, this case shows that in rural areas where social networks are dense but formal institutions are relatively sparse and actors are highly scattered, the generation of macro communities often cannot be achieved overnight. Instead, it originates from a large number of teacher-student collaborative "micro-practices" based on specific projects, relying on the accumulation of social trust and gradual commitment. Like trickles, these micro-practices gradually accumulate social capital, shape cooperation norms, cultivate a common language and shared vision through continuous successful interactions and value proof, laying an indispensable practical foundation, relational network, and social cognitive foundation for higher-level, wider-ranging, and more stable institutionalized cooperation in the future. In other words, the flexible practice and relationship construction of teacher-student collaboration are the forerunners and breeding grounds for rigid systems to truly take root, grow, and exert effects in rural society.

Secondly, it strongly responds to the urgent call for the transformation of higher vocational social services towards "strong intelligence" from the perspective of vivid practice. Existing studies mostly stay at the level of value advocacy, problem identification, and macro path description. This case proves the practical feasibility of the transformation and its micro-implementation mechanism through detailed mechanism analysis. The key lies in effectively measuring, manifesting, and incentivizing teachers' intellectual contributions to solving practical industrial problems with high weight through profound evaluation system reforms; at the same time, reasonably recognizing, valuing, and guiding students' in-depth practice participation through credit system and curriculum reforms. When institutional channels are opened up and action incentives are activated, teachers and students of higher vocational

colleges are fully capable of becoming the main force providing high-value-added "strong intelligence" services such as technological research and development, process innovation, product creativity, and digital solutions. The teacher-student collaboration model transforms "strong intelligence services" from the "patent" and "point-like behavior" of a few experts and professors into a "mass" innovative practice that can be widely participated in by teachers and students teams and flexibly organized based on projects, greatly expanding the intellectual supply, penetration depth, and response speed of higher vocational colleges in serving industrial upgrading.

Finally, it vividly interprets and materializes the discussion on the sinking of vocational education resources to counties [12]. Resource sinking is often regarded as a macro policy orientation, fiscal allocation, or school layout issue. This case reveals the micro-implementation mechanism of sinking and the logic of connecting the "last mile": the teacher-student collaborative unit is the most effective "capillary tube" for intellectual resources, technical resources, and human resources to achieve precise "drip irrigation" and directly reach the "root system" of rural industrial needs. With its organizational flexibility, goal focus, low cost, and operational agility, it can flexibly bypass resource congestion, information attenuation, and supply-demand mismatch that may exist at administrative levels. Taking specific projects as carriers, it directly delivers cutting-edge knowledge, applicable technologies, youthful vitality, and innovative thinking to the micro-economic units, community scenarios, and farmers with the most urgent needs, realizing the accuracy and effectiveness of resource investment as well as the contextuality and depth of the educational process.

Of course, the effective operation and continuous optimization of the teacher-student collaboration model depend on the collaborative support of a set of internal and external conditions. The key internal condition lies in the fundamental revolution of the college's evaluation paradigm. It is necessary to establish an evaluation and incentive system that truly advocates practice, contribution orientation, and breaks the "five-only" tendency [13]; at the same time, it is necessary to reserve and cultivate a sufficient number of "double-qualified teachers" who are proficient in both theory and industry,

and establish a flexible teaching management system that supports students to deeply participate in long-cycle and high-risk real projects, such as a credit bank, curriculum exemption, flexible school system, safety guarantee, and insurance mechanism. External conditions include the open attitude of local governments, appropriate resource support and policy convenience, as well as the regional industry having a certain demand density, diversity, and willingness to pay to maintain the sustainability and scale effect of services. This model also faces practical challenges such as project technical uncertainty risks, ambiguous definition of intellectual property ownership and benefit sharing, personal and property safety guarantees for teachers and students in remote areas, and possible project interruption due to students' graduation. For colleges and regions intending to learn from this model, it is recommended to adopt a gradual strategy: first, institutional breakthrough and pilot first. Select one or two professional fields where they have advantages and local areas have urgent needs to set up reform "pilot zones", concentrate resources to create successful models, and form a visible and learnable demonstration effect; second, platform empowerment and ecological cultivation. Build an integrated digital social service project management and matching platform [14] to promote the intelligent docking and process visualization of needs, teams, resources, and results, and actively build a regional MSE service ecosystem with local governments, leading enterprises, and industry associations to improve system effectiveness; third, standardized development and risk sharing. Jointly design project liability insurance, accident insurance, and risk-sharing mechanisms with partners, formulate standardized project processes, contract templates, intellectual property agreements, ethical norms, and safety plans, ensuring that this dynamic model can move forward steadily in innovative exploration.

## **6. Conclusions and Prospects**

At the historical intersection of the national comprehensive promotion of Rural Revitalization and the in-depth integration of the high-quality development strategy of vocational education, the social service function of higher vocational colleges is in urgent need of a profound paradigm innovation, moving from marginal auxiliary to central support, and from

homogeneous supply to differentiated empowerment. Through the in-depth deconstruction and mechanism explanation of the teacher-student collaborative empowerment model in Wencheng County, this study reveals a new collaborative governance path that is highly adaptable to the fragmented, differentiated, and vulnerable industrial ecology of rural areas and can effectively solve the "last mile" dilemma of MSE services. The research shows that teacher-student collaboration is far from a temporary or auxiliary service method. In essence, it is a key meso-mechanism that reconstructs the resource allocation logic of vocational education, stimulates the internal vitality of the organization, and deeply integrates into the local governance network. By incubating and empowering numerous dynamic, flexible, and rooted "micro-governance hubs", it transforms the grand national strategy of industry-education integration and the local agenda of rural revitalization into concrete and micro creative actions, visible and tangible value output, and deeply rooted trust relationships. It reshapes teaching in real services, cultivates talents in complex scenarios, and innovates knowledge in solving problems, ultimately realizing the organic unity and value symbiosis of educational logic, industrial logic, and social logic.

The theoretical contribution of this study lies in clearly defining and systematically demonstrating the teacher-student collaborative unit as a core active meso-actor in the industry-education integration collaborative governance network, and comprehensively explaining its four-link dynamic operational mechanism of "dual internal drive initiation, flexible access perception, learning-by-doing response, and local integration support" and its cyclical enhancement logic. It provides a new theoretical lens and analytical unit for understanding the practical form, power source, and evolutionary process of industry-education integration at the micro level. Its practical value lies in providing a set of tested, operable, transferable, and extensible action frameworks and model blueprints for many higher vocational colleges that are rooted in counties, committed to serving local areas but facing resource and model dilemmas. It proves that by deepening internal reforms to stimulate the vitality and wisdom of grass-roots teacher-student units, it is completely possible to achieve the coordinated progress and virtuous cycle of high-quality social services, in-

depth talent training, and down-to-earth applied scientific research under limited resource conditions.

This study is based on the in-depth exploration of a single case, and the generalizability of its conclusions needs to be further empirically tested, compared, and theoretically revised in higher vocational colleges of different regional types, different industrial structures, and different professional clusters. Future research can be deepened and expanded in the following directions: first, carry out cross-regional and cross-professional comparative case studies or large-sample surveys to deeply explore the optimal adaptation conditions, morphological variations, effectiveness differences, and limiting factors of the teacher-student collaboration model under different levels of economic and social development, different rural cultural backgrounds, and different leading industrial structures; second, track and study how emerging technologies such as digital twins, artificial intelligence, and big data profoundly reshape the organizational methods, service processes, knowledge transfer, decision-making models, and empowerment effectiveness of teacher-student collaboration, exploring new forms, new paradigms, and new challenges of industry-education integration and rural empowerment in the "digital intelligence era"; third, conduct long-term follow-up longitudinal studies to investigate the impact of this model on the career development paths and professional identity of participants (teachers and students), its shaping effect on the school's characteristic school-running culture and organizational capacity formation, as well as its far-reaching impact on the accumulation of social capital, endogenous development capacity, and sustainable development capacity of rural communities, conducting a more macro, long-term, and comprehensive value evaluation and social benefit analysis. It can be predicted that grass-roots micro-innovations such as teacher-student collaboration, which originate from the front line of educational practice and are full of vitality and creativity, with their unique agility, penetration, symbiosis, and evolution, will surely inject a steady stream of basic, endogenous, and creative power into building a modern vocational education system with Chinese characteristics, rooted in rural areas, and full of resilience, and thus into realizing comprehensive rural revitalization and Chinese-

style modernization.

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