

Empowering Talent Development through Education and Technology, Driving Industrial Upgrading with Talent Engines: An Empirical Study on the Integrated Reform of China Eye Valley in Wenzhou

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Abstract: This study takes Wenzhou China Eye Valley as a core case to explore how the "trinity" reform of education, technology, and talent drives the development of key industries by empowering talent. It systematically analyzes how China Eye Valley transforms the excellent educational resources and cutting-edge technological platforms of Wenzhou Medical University's Optometry and Vision Science discipline into an ecosystem that systematically empowers talent development, ultimately forming a virtuous cycle of "promoting science through education, cultivating talent through science, and revitalizing industry through talent." The research finds that the Eye Valley model, through four practical mechanisms — "project-based curricula, open platforms, dual mentorship, and embedded entrepreneurship"—effectively shortens the cycle from learning to innovation and enhances the density and speed of industrial innovation. This study constructs a three-stage model of "talent supply – capacity transformation – industrial value addition," reveals the synergistic mechanisms among industrial colleges, public platforms, and enterprise clusters, and demonstrates the key role of talent cultivation in technology transfer, enterprise incubation, and ecosystem building through specific data and cases. It also extracts a replicable and actionable regional industrial development paradigm of "one industry, one college, one platform," providing systematic references for local governments, universities, and enterprises.

Keywords: Industry-education integration; Industrial college; Talent cultivation; Eye health industry; Regional innovation; Practical model

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1. Introduction: Research Background and Significance

The world today is undergoing profound changes unseen in a century, with technological innovation becoming the main battlefield of international strategic competition, and talent serving as the core resource in this contest. Major national strategies have for the first time emphasized the "trinity" of education, technology, and talent, highlighting their organic connections and synergistic effects, providing strategic and foundational support for modernization. The ability to construct an efficient integrated development system for education, technology, and talent has become key to determining regional industrial competitiveness and sustainable development.

Wenzhou, as a pioneer of China's private economy, is at a critical stage of industrial transformation and upgrading. Traditional advantageous industries face pressure to improve quality and efficiency, while cultivating strategic emerging industries such as biomedicine and intelligent equipment urgently requires high-level talent and innovative resources. Against this backdrop, leveraging the internationally leading advantages of Wenzhou Medical University's Optometry and Vision Science discipline, China Eye Valley emerged. It is not only a high-level new industrial platform but also tasked with exploring the "government-industry-university-research-medicine" integrated innovation mechanism and building a world-class eye health industry hub. The practice of Eye Valley is essentially a pioneering experiment that uses key industries as carriers to deeply integrate educational resources and technological platforms, systematically empower talent, and thereby drive industrial development.

However, in practice, long-standing barriers between education, technology, and industry — such as "the mismatch between the skills cultivated by universities and those needed by enterprises," "the disconnection between research outcomes and market applications," and "the inefficient flow of talent between and within systems" — continue to constrain the full effectiveness of integration. Therefore, this study focuses on the case of China Eye Valley, aiming to explore how educational systems and technological platforms can effectively empower talent

through integrated institutional design and mechanism innovation in the context of regional key industry development. How does this empowerment translate into tangible industrial innovation capacity and competitiveness through the creative activities of talent, ultimately forming a virtuous cycle of "promoting science through education, cultivating talent through science, and revitalizing industry through talent"? By analyzing this question, this study seeks to reveal the internal logic, operational mechanisms, and key bottlenecks of integrated reform.

2.The Core Framework of the Eye Valley Talent Cultivation Model

The Eye Valley model is not a single policy or project but an ecosystem composed of "one industrial college, two supporting platforms, and three types of participating entities." As shown in Figure 1, the government provides policy and resource support, the Wenzhou Medical University Optometry Industrial College serves as the core carrier for talent cultivation, and the China Eye Valley technology platform and the Optometry Medical Group industry platform provide dual support, ultimately driving the formation of industrial clusters and enterprise incubation.

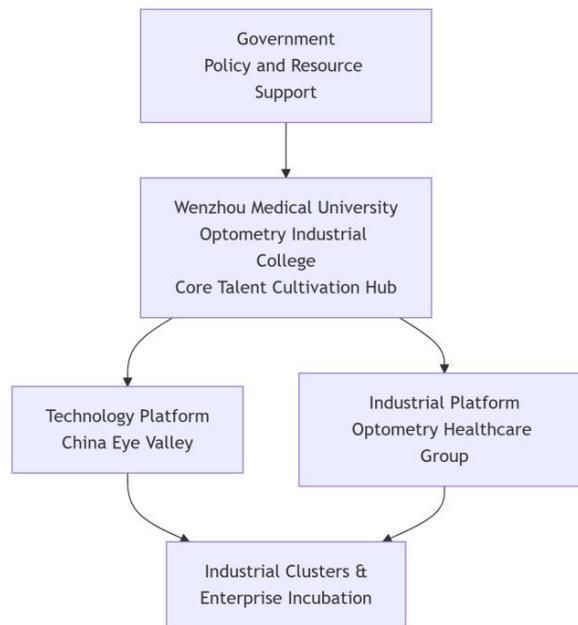


Figure 1: China Eye Valley Talent Cultivation Ecosystem

Within this ecosystem, the Eye Valley model systematically integrates industrial demands into the entire process of talent cultivation through the four practical mechanisms of "project-based curricula, open platforms, dual mentorship, and embedded entrepreneurship." This effectively addresses the disconnection between theory and practice in traditional education and cultivates high-quality talent urgently needed by enterprises. These four mechanisms are not isolated but form an interconnected and synergistically enhanced organic whole.

2.1 Project-Based Curricula: Bringing Enterprise Work into the Classroom

Real enterprise R&D topics and product needs are transformed into teaching projects. For example, Johnson & Johnson's myopia control contact lens development was broken down into subtasks integrated into courses like Biomaterials Science and Optometry. This approach ensures learning aligns with industry trends. Over three years, 100% of graduation projects originated from real enterprise topics, with 41 out of 327 projects directly adopted by enterprises.

2.2 Open Platforms: Enabling Students to Use Enterprise-Grade Equipment

Eye Valley integrates advanced equipment from leading firms (e.g., ZEISS, Topcon) into a public platform network for testing, pilot production, and clinical validation. Equipment is classified and managed by level to ensure safety and utilization efficiency. Platform usage increased from 35% to 78% by 2023, serving over 6,300 users.

Students receive training and certification, shortening post-graduation training time by an average of 50%.

2.3 Dual Mentorship: Involving Enterprise Experts in Cultivation

Mentors include university academics and enterprise experts (42.6% of teachers have industry backgrounds). Enterprise mentors participate in curriculum design, project guidance, and graduation assessment. A structured incentive system aligns mentor contributions with enterprise performance and university collaboration. Graduate professional alignment reaches 88%, with 94% enterprise satisfaction.

2.4 Embedded Entrepreneurship: From Innovation to Startup

A full-chain support system covers awareness, skill training, incubation, and acceleration. For example, a student team developed wearable intraocular pressure monitoring technology, secured angel investment, and launched a product with Eye Valley's incubation support. The model has nurtured 89 startups, attracted ¥210 million in financing, and created 623 jobs, with a 48.3% startup survival rate.

3. Synergistic Effects and Operational Logic of the Four Mechanisms

3.1 Intrinsic Connections and Synergistic Effects Among Mechanisms

These four mechanisms are interdependent and tightly coupled, forming a complete empowerment system. Project-based curricula pose real problems originating from enterprises, providing clear direction and content for talent cultivation; open platforms offer practical tools and scenarios for solving problems, providing a carrier for applying theoretical learning; dual mentorship provides authoritative guidance during the problem-solving process, accelerating students' capacity growth; and embedded entrepreneurship provides an industrial outlet for excellent solutions, maximizing talent value.

This synergy manifests in practice as a closed-loop system for talent cultivation. Taking ophthalmic device development as an example, enterprises propose new product demands (the source of project-based curricula), student teams conduct design and testing on the Eye Valley platform (supported by open platforms), university and enterprise mentors jointly guide technological breakthroughs (empowered by dual mentorship), and excellent outcomes achieve industrialization through entrepreneurial companies (the outlet of embedded entrepreneurship). This closed loop not only cultivates students' comprehensive abilities but also directly drives industrial technological innovation.

3.2 Implementation of the "Three Realities" Principle

The successful operation of the four mechanisms fundamentally lies in adhering to the principle of "three realities." First, connecting with real enterprise demands ensures that all teaching projects originate from actual problems currently faced by enterprises, guaranteeing the timeliness and practicality of learning content. Second, using real industrial scenarios allows students to learn and practice under conditions identical to actual work environments, preparing them for future job roles in advance. Third, adopting real market evaluations ensures that talent cultivation quality is assessed not only by the university but also by enterprises and the market, forming an outcome-oriented quality perspective.

The implementation of the "three realities" principle requires institutional safeguards. The industrial college has established a regular enterprise demand research mechanism, updating the project database each semester; signed equipment sharing agreements with the Eye Valley platform to ensure priority teaching usage; and formulated measures for enterprise participation in talent evaluation, incorporating enterprise satisfaction as a key assessment indicator. These institutional arrangements translate the "three realities" from concept into action.

3.3 Manifestations of Talent Cultivation Effectiveness

The synergistic operation of the four mechanisms has produced significant results across multiple dimensions. In terms of talent supply, graduates from the industrial college are not only sufficient in quantity but also excellent in quality. Data show that the postgraduate entrance examination rate for optometry and vision science graduates

remains between 55% and 75%, with ophthalmology-related majors accounting for 68% to 86% of these; employment rates remain stable at 91% to 92%, with professional alignment rates as high as 79% to 88%. These indicators far exceed the national average for similar majors.

In terms of enterprise satisfaction, surveys of partner enterprises indicate that 94% of enterprises believe Eye Valley graduates "meet or exceed job requirements," and 87% report that graduates' training periods are shortened by over 40% compared to ordinary graduates. A Johnson & Johnson HR representative stated, "Eye Valley-cultivated students are familiar with our equipment operation processes, reducing training time by six months and enabling them to quickly engage in practical work after onboarding."

In terms of industrial contribution, students' participation in technological R&D and entrepreneurial activities directly drives industrial development. Over the past three years, students have participated in applying for 83 patents and publishing 46 papers; 89 enterprises have been incubated, securing 210 million yuan in financing; and student entrepreneurial enterprises have created 623 jobs. These outcomes not only reflect the quality of talent cultivation but also demonstrate the supportive role of education in industrial development.

4.Theoretical Contributions and Practical Implications of the Eye Valley Model

4.1 Theoretical Innovation: Constructing the "Talent Empowerment Spiral" Model

Based on Eye Valley's practice, this study proposes the "Talent Empowerment Spiral" model, which consists of three interrelated layers. The inner layer is the integrated education layer, which restructures teaching content through project-based curricula to deeply align talent cultivation with industrial demands. The middle layer is the value realization layer, which provides students with practical scenarios and professional guidance through open platforms and dual mentorship, promoting capacity transformation. The outer layer is the ecosystem feedback layer, which drives the industrialization of excellent outcomes through embedded entrepreneurship and feeds back into the education system.

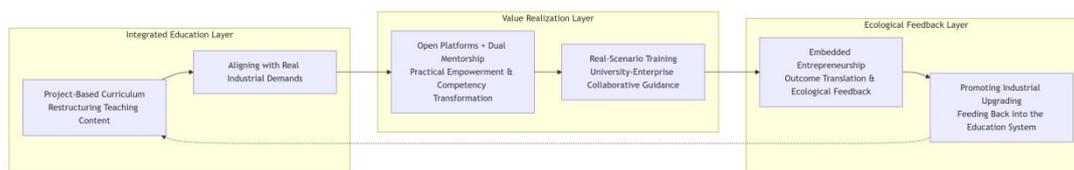


Figure 2: Talent Empowerment Spiral Model

4.2 Practical Implications: The Replicable "One Industry, One College, One Platform" Model

The successful practice of the Eye Valley model provides valuable experience for other regions and industries. This study extracts a regional industrial development paradigm of "one industry, one college, one platform," which consists of four key elements.

First, selecting key industries. Regions should choose strategic emerging industries with local foundations, significant potential, and urgent talent demands, such as the eye health industry selected by Eye Valley. Industry selection should consider local resource endowments, market prospects, and industrial chain completeness.

Second, co-building industrial colleges. Industrial colleges should be entity institutions jointly established by universities and enterprises, with independent management and resource allocation rights. The governance structure should implement a dean responsibility system under a council to balance the interests of all parties; operational mechanisms should establish systems for demand linkage, curriculum co-development, and faculty sharing.

Third, building public platforms. Platform construction should follow the principle of "co-building, sharing, and co-using," integrating resources from multiple stakeholders, including the government, universities, and enterprises. Platform functions should cover R&D, pilot-scale production, testing, incubation, and other stages, serving as a bridge connecting education and industry.

Fourth, innovating institutional mechanisms. It is necessary to break through the constraints of traditional management systems and innovate in personnel management, fund usage, and outcome distribution. In particular, establishing teacher evaluation systems and student cultivation plans that adapt to the characteristics of industry-education integration is essential.

This model has been piloted and promoted in other industries in Wenzhou. In the electrical industry, Wenzhou University and Chint Group co-built an Electrical Industry College, relying on the Zhejiang Low-Voltage Electrical Technology Innovation Service Platform to cultivate smart electrical talent. In the pump and valve industry, Wenzhou Vocational & Technical College and Kaiquan Pump Industry co-built a Pump and Valve Industry College, relying on the Zhejiang Pump and Valve Technology Innovation Service Platform to cultivate high-end manufacturing talent. Preliminary practices indicate that this model has good adaptability and promotion value.

4.3 Policy Recommendations: Systematically Promoting Industry-Education Integration Reform

Based on the research findings, this paper proposes the following policy recommendations:

For local governments, it is essential to strengthen top-level design and overall coordination. Develop special plans for industry-education integration, clarify linkage paths between key industries and educational resources; establish special funds for industry-education integration to support the construction of industrial colleges and platforms; improve talent policies to provide housing, children's education, and other supporting benefits for talent cultivated through industry-education integration.

For higher education institutions, it is crucial to deepen educational reform and mechanism innovation. Adjust discipline and program settings to align more closely with industrial demands; reform teacher evaluation systems to increase the weight of practical teaching and industrial services; expand institutional autonomy to allow industrial colleges to explore innovations in student recruitment, cultivation, and management.

For enterprises, it is important to change perspectives and increase investment. Shift from being talent users to talent cultivators, deeply participating in the educational process; open technological resources and practical positions to provide students with authentic learning environments; establish long-term investment mechanisms to incorporate talent cultivation into enterprise development strategies.

For educational administrative departments, it is necessary to improve standards and evaluation systems. Develop certification standards for industry-education integration-oriented universities and programs; establish talent cultivation quality evaluation systems oriented by industrial demands; encourage third-party institutions to evaluate the effectiveness of industry-education integration.

5. Conclusion

This study, through an in-depth analysis of China Eye Valley's practice, systematically reveals the internal logic and operational mechanisms of the integrated reform of education, technology, and talent. The research finds that the Eye Valley model, through the synergistic effects of the four mechanisms—project-based curricula, open platforms, dual mentorship, and embedded entrepreneurship—constructs a virtuous cycle of talent cultivation and industrial innovation. The core value of this model lies in transforming industry-education integration from a conceptual advocacy into an operable, evaluable, and sustainable systematic project.

Eye Valley's practice demonstrates that high-quality talent cultivation requires systemic restructuring of the educational ecosystem. This involves not only reforming curriculum content and teaching methods but also building university-enterprise collaborative education platforms, establishing market-oriented evaluation systems, and fostering a culture that encourages innovation. Only when education is truly rooted in industrial soil can talent be fully empowered; only when talent is deeply integrated into industrial practice can innovation continuously emerge; and only when innovation effectively drives industrial upgrading can regional development gain lasting momentum.

The "one industry, one college, one platform" model provides a replicable path for regional industrial upgrading. The promotion of this model requires multi-party collaboration among the government, universities, and enterprises;

multiple guarantees in policy, funding, and institutions; and deep-seated changes in concepts, culture, and ecosystems. In the context of accelerating the construction of a nation strong in education, technology, and talent, deepening industry-education integration reform and innovating talent cultivation models are of significant strategic importance for enhancing regional competitiveness and promoting high-quality development.

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