Educational and Humanities
ISSN Print: 3104-4352
ISSN Online: 3104-4360
CD ISSN: 3104-4379
https://doi.org/10.63313/EH.9052

Dynamic Mechanism, Patience Dilemma and Incentive Pathways for Enterprise Participation in Industry-Education Integration Under the Background of Digital Transformation

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How to cite this paper: Yang, F. (2026). Dynamic Mechanism, Patience Dilemma and Incentive Pathways for Enterprise Participation in Industry-Education Integration Under the Background of Digital Transformation. *Educational and Humanities*, 2(3), 65 - 77. ISSN Print: 3104 - 4352; ISSN Online: 3104 – 4360.
https://doi.org/10.63313/EH.9052
Published: 2026-03-23

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Abstract

Industry-education integration is a core path for enterprises to achieve high-quality development in digital transformation, driven by multiple factors including economy, strategy and policy. However, the superposition of accelerated technological iteration, uncertain technological routes, the impact of the gig economy and short-termism in the capital market is systematically eroding enterprises' long-term patience in school-enterprise co-construction, leading to a "patience dilemma" characterized by weakened willingness to cooperate, superficial participation and insufficient sustainability. The solution lies in establishing a risk buffer mechanism across technological cycles, correcting the cost externality of the gig economy, and activating the asset attribute of educational contributions. This will promote industry-education integration from formal cooperation to substantive symbiosis, and realize two-way empowerment and value co-creation between enterprises and education amid the tension between speed and stability.

Keywords

Digital Transformation; Vocational Education; Industry-Education Integration; Enterprise Participation; Patience

1. Introduction: The "Lack of Patience" of Enterprises Participating in Industry-Education Integration in Digital Transformation

As the wave of digital technology reshapes the industrial landscape with disruptive force, a brand-new era proposition is placed before all enterprises: how to build a talent moat sufficient to support themselves through cycles and evolve continuously at a time when technological iteration is measured in months? Digital

transformation is no longer a "multiple-choice question" but a "compulsory question" related to survival and development. In this profound transformation, enterprises find that simply purchasing equipment cannot solve the fundamental problem. The implementation and innovation of technology ultimately return to the core element of "people". Thus, industry-education integration, as a link between the supply side and demand side of talents, has been endowed with the core mission of solving the shortage of digital skills, supporting industrial upgrading and promoting innovation implementation.

On the surface, the motivations for enterprises to participate in industry-education integration are clear and diverse: economic motivation drives them to reduce costs and increase efficiency, strategic motivation guides them to plan for the future, and policy motivation escorts them. However, when we go deep into the texture of digital transformation, we find that enterprises' considerations of return on investment, return speed, income risk and other factors, like a double-edged sword, while stimulating efficiency, are quietly eroding enterprises' patience in participating in industry-education integration. Accelerated technological iteration and uncertainty disintegrate the expectation of educational investment; the rise of the gig economy reconstructs the relationship between enterprises and workers, making "long-term cultivation" bulky and inefficient in the face of "flexible procurement"; the short-termism orientation of the capital market pushes long-cycle and highly spillover activities such as talent cultivation to the edge of enterprise resource allocation. These "patience dilemmas" profoundly reveal the internal conflict between the logic of digital capital and the logic of educational development. It forces us to ask: in an era where everything pursues "speed", how can we guard the "slowness" necessary for talent cultivation? Taking this as the starting point, this paper examines enterprises' behavior of participating in industry-education integration in the specific context of digital transformation, deeply analyzes why enterprises' actions are so hesitant despite the abundant motivations on the surface, and attempts to explore an incentive approach to balance speed and accumulation, efficiency and precipitation.

2. Driving Forces: Endogenous Motivations and Exogenous Guarantees for Enterprises to Participate in Industry-Education Integration

Why are enterprises willing to devote themselves to industry-education integration? This is by no means simply due to public welfare feelings, but the result of the joint action of multiple practical interests. It includes the practical drive of human capital cost control and economic income expansion, the strategic consideration of technological iteration support and talent supply layout, as well as the external support of policy dividends and social expectations. The three driving forces of economy, strategy and policy correspond to the survival logic, development logic

and risk avoidance logic of enterprises respectively. They are nested and strengthened with each other, jointly building the driving foundation for enterprises to move from "shallow cooperation" to "deep participation".

2.1. Economic Motivation: Practical Drive of Cost Optimization and Value Gain

Economic rationality constitutes the basic logic and core incentive for enterprises to participate in industry-education integration. Against the background of the in-depth advancement of digital transformation, enterprises' practical demands for cost control optimization, skilled talent supply and market space expansion through industry-education integration have become increasingly prominent, and the economic driving force presents a more diversified and pragmatic practice orientation.

First, effectively reduce the cost of human capital acquisition and training. While digital technology reshapes the industrial ecology, it also pushes up the institutional cost of enterprise recruitment and training. By embedding talent recruitment into the whole process of vocational education in advance, enterprises can lock in suitable talents through a customized training model and solve the problem of information asymmetry from the source. For example, the training base jointly built by Jiangmen New Energy Storage Industry Alliance and Wuyi University, with the "intern + management trainee" project as the carrier, not only meets students' employment needs but also solves the practical dilemma of "difficult recruitment, high training costs and long running-in period" for enterprises. At the same time, the "project-based training" explored in various regions further amplifies the cost reduction effect. Taking Xiong'an New Area as an example, the "project-based training" policy implemented in 2025 jointly carries out training in artificial intelligence and other fields for employees with vocational colleges, providing subsidies at the standard of 30 yuan per class hour per person, with a maximum subsidy of 3,000 yuan per person. The first batch of subsidies of 135,840 yuan has been allocated to enterprises. This differentiated subsidy model of "enterprises ordering and government providing dishes" has significantly reduced the financial cost of skill upgrading for enterprise employees.

Second, cultivate new growth points and expand brand value. The value spillover of the industry-education integration platform is going beyond simple talent supply and evolving into a frontier position for enterprise technology verification, product promotion and market expansion. For example, Huawei ICT Academy provides software and hardware equipment such as TaiShan servers and Atlas intelligent computing platforms to cooperative colleges, collects equipment purchase and maintenance fees, and obtains reasonable income through services such as course authorization and teacher certification training, forming a diversified income model of "equipment supply + technology authorization + service output". This model not

only strengthens enterprises' market penetration ability but also opens up a new sustainable income space for enterprises.

2.2. Strategic Motivation: Strategic Choice of Transformation Support and Long-Term Competitiveness Layout

Faced with the accelerated iteration of digital technology and the profound reconstruction of the market environment, enterprises need to build dynamic adaptive capabilities more than ever before. Participating in industry-education integration is a key strategic move for enterprises to shift from "passively adapting to changes" to "actively shaping the future". Compared with economic benefits, enterprises value more the long-term strategic value released by industry-education integration in technology accumulation and talent reserve. It not only provides enterprises with a channel to break the bottleneck of innovative resources but also injects sustainable talent momentum into digital transformation.

First, support technological iteration and process upgrading. Enterprise technological iteration is inseparable from the continuous input of innovative resources, and industry-education integration provides enterprises with an "external brain" and "experimental field" for technological innovation. By embedding their own technical standards and production processes into college teaching links, enterprises can carry out cutting-edge exploration with the help of college scientific research resources and conduct technology verification based on real production scenarios, forming a virtuous circle of "teaching-research-production". For example, Fujian Quanzhou Panpan Food Group has cooperated with 30 universities including Jiangnan University and Fuzhou University to carry out the "dual-system" academic upgrading project, training a total of 11,082 person-times. It has not only improved employees' digital literacy but also implemented 58 digital topics through the "Technological Innovation Competition", creating 14.62 million yuan of direct economic value and adding 68 new patents. This case clearly shows that industry-education integration is becoming the "second R&D department" for technological innovation of traditional enterprises and a strategic fulcrum for enterprises to solve the dilemma of "technological hollowing out" in digital transformation.

Second, build a stable skill supply system. In the digital era, the stability of talents is directly related to the stability of the industrial chain. Long-term participation in industry-education integration helps enterprises build a closed-loop talent supply channel of "training-employment-promotion", which is conducive to transforming the uncertainty of the external labor market into the certainty of internal talent reserve. For example, Huawei ICT Academy has built ICT-related majors with many colleges and universities across the country, integrating enterprise post skill requirements into the whole process of talent training, forming a stable skilled talent supply system, which not only meets the continuous demand for talents in its

own digital transformation but also provides basic support for the stable operation of the entire ICT industrial chain. This strategic layout of "determining education by industry and promoting industry by education" transforms talents from a "cost item" of enterprises into an accumulable "strategic asset".

2.3. Policy Motivation: External Guarantee of Institutional Incentives and Risk Mitigation

The effectiveness of policy tools depends on whether they can accurately respond to the core demands of behavioral subjects, and is a key external force guiding enterprises to participate in industry-education integration. In the field of industry-education integration, a series of incentive policies such as taxation, finance, land and credit issued by the state and local governments are directly transformed into perceptible economic benefits for enterprises through institutionalization, and reduce the uncertainty and sunk cost risks in the participation process, thus building a complete "incentive-guarantee" dual mechanism supporting enterprises' deep participation externally.

From the perspective of local practice, the 2024 provincial-level pilot policy for the construction and cultivation of industry-education integration enterprises in Heilongjiang Province provides a typical institutional sample. The policy forms a systematic external guarantee through multi-dimensional precise incentives: in terms of taxation, investments made by pilot enterprises in running vocational education that meet relevant regulations can be used to offset 30% of the education surcharges and local education surcharges payable in the current year. In terms of finance, the policy provides financial support for enterprises to participate in industry-education integration by organizing school-enterprise cooperation innovation achievements to participate in financing project roadshows and building a platform for industrial and capital docking. In terms of land, the construction land for vocational colleges invested by enterprises or built in cooperation with the government that meets the Catalogue of Land Allocation can be supplied through allocation, and flexible land supply modes such as long-term lease and combination of lease and transfer can be explored to effectively reduce the initial investment pressure of training base construction. In terms of credit, the policy clearly gives priority or convenience to enterprises with excellent industry-education integration credit evaluation results in routine inspections, listing financing, government fund support, evaluation and commendation, etc., and publicly publicizes them through the "Credit China" website, directly linking enterprises' participation in industry-education integration with market credit value.

The above policy tools jointly build a complete incentive chain of "cost reduction-channel expansion-pressure relief-value empowerment". It not only responds to enterprises' economic rationality through immediate benefit compensation but also cultivates enterprises' strategic patience through long-term

expectation injection. It is this perceptible and implementable institutional supply that transforms policy motivation from external "driving force" into "attractiveness" of enterprise decision-making, becoming a key external guarantee to solve the "last mile" problem of enterprise participation.

3. Sustainability Challenges: The Patience Dilemma of Enterprises Participating in Industry-Education Integration Under Digital Transformation

While digital transformation fosters the internal demand for enterprises to participate in industry-education integration, it also deconstructs the foundation of enterprises' long-term investment from three dimensions: technology, employment and capital. Accelerated technological iteration and route differentiation squeeze investment expectations, flexible employment models weaken the motivation for long-term talent cultivation, and short-termism in the capital market distorts resource allocation, jointly leading to weakened enterprise participation willingness, insufficient cooperation depth and difficulty in sustaining long-term mechanisms. The resulting "patience dilemma" is not the subjective slack of enterprises, but a rational result of the joint action of multiple logics in the digital scenario, as detailed below.

3.1. Technological Logic: Disintegration of Expectations Under the Dual Pressure of Acceleration and Uncertainty

When the speed of technological iteration completely crushes the linear expectations of talent cultivation, and the differentiation of technological routes turns skill investment direction into a gamble, this is the deep mechanism for the inevitable dissipation of the "patience dilemma" at the technical level. It is not that enterprises are unwilling to invest, but the technological logic itself deprives them of the courage and basis for investment.

First, technological acceleration leads to a structural mismatch in the "input-output" cycle of talent cultivation. The life cycle of digital technology has been greatly shortened from several years in traditional industries to several months, and the speed of technological iteration completely breaks the linear expectations of talent cultivation, while industry-education integration itself faces a time difference between skill transformation and income realization. This means that the resources invested by enterprises may face the risk of technological obsolescence before students graduate, even leading to the embarrassing situation of "being outdated as soon as trained". The phenomenon that "textbooks lag behind technological iteration by 3 to 5 years" found in the cooperation between Hunan Vocational College of Transportation and Zoomlion Heavy Industry is a typical microcosm of this contradiction. This "learning-application gap" caused by technological acceleration makes most enterprises prefer to stay in shallow cooperation by

providing internship positions rather than deeply participating in the whole long-cycle talent cultivation process.

Second, technological uncertainty makes the direction of talent cultivation lose a stable anchor. Many industrial fields have a pattern of parallel competition among multiple technological routes, such as the differentiation between pure electric and hydrogen energy solutions in the new energy vehicle field. Enterprises cannot accurately predict which technological route will become the mainstream, resulting in the loss of a stable anchor for the direction, skill standards and post structure of talent cultivation. Wu Jianxin et al. (2014) found through the Delphi expert consultation method that the timely update of professional standards is the core of the long-term mechanism of school-enterprise cooperation. However, when technological routes become a "moving target", enterprises have no basis to make correct investment decisions at all—that is, investment may be directed to an eliminated route, and non-investment may miss the future.

Technological acceleration compresses the time window for enterprise returns, and technological uncertainty obscures the future horizon of enterprise decision-making. The superposition of the two puts enterprises in a prisoner's dilemma of "missing the technological outlet while waiting, and facing route risks while investing". In this context, enterprises' choice of shallow cooperation and avoidance of in-depth talent cultivation investment has become a rational choice based on the reality of technological development.

3.2. Employment Logic: The Gig Economy Weakens Enterprises' Willingness to Invest in the Long Term

The gig economy spawned by digital transformation has fundamentally reconstructed enterprises' employment models and cognition of human resources, and greatly weakened the internal motivation of enterprises to carry out long-term human capital investment through school-enterprise co-construction from the aspects of cooperative relations and cost accounting, becoming a structural resistance to the in-depth integration of industry and education.

As the latest development of flexible capital accumulation, the gig economy decomposes labor into modular short-term tasks with the help of platform technology, promoting enterprises' employment logic to shift from "long-term cultivation and retention" to "on-demand flexible procurement". Enterprises no longer need to bear a series of responsibilities for employees' long-term training, career development and social security, and can quickly match labor resources through platforms to meet phased production and operation needs. In addition, the employment matching of the gig economy is intermittent, and there is only a cooperative relationship between labor providers and enterprises during a single task. This loose cooperative relationship completely cuts off the realistic basis for enterprises to make long-term human capital investment in employees. Enterprises

no longer regard workers as human capital requiring continuous investment, but as replaceable "task-based production factors" at any time.

Taking the employment model of more than 7 million Meituan riders as an example, the relationship between enterprises and riders is not a traditional employment relationship, but a task-based connection mediated by algorithms. Even the "Meituan Rider Vocational Training and Academic Further Study Program" cooperated by the Open University of China and Meituan only focuses on short-term skill training that is "learnable and usable, easy to learn and use", rather than in-depth human capital training for the whole career cycle. From the perspective of enterprise cost-benefit accounting logic, when labor can be "purchased" instantly through the platform and quickly adapted to post needs, the 3-5 year school-enterprise joint talent training project appears lengthy and inefficient. This transformation of employment model not only makes enterprises lose the motivation to cultivate talents for a long time but also poses a realistic challenge to the "encouraging enterprises to run high-quality vocational education" proposed in the new Vocational Education Law, becoming an important constraint factor for the in-depth development of industry-education integration.

3.3. Capital Logic: Distortion of Resource Allocation Under the Short-Term Performance Orientation

The short-termism orientation of the capital market is profoundly reshaping the behavioral logic of enterprises participating in industry-education integration, alienating the in-depth cooperation that should be "joint talent cultivation" into formal "talent procurement". Dominated by this logic, enterprise participation presents a distinct characteristic of "lack of patience"—abundant surface motivation but thin willingness to invest continuously.

The root cause lies in that the logic of capital market judgment on enterprise value has fully penetrated into the decision-making preferences of management. When quarterly profits become the valuation anchor and annual revenue is tied to performance assessment, any investment that cannot realize returns in the current period faces a legitimacy crisis of being compressed. Industry-education integration is exactly a typical "long-cycle, high-spillover" investment: talent cultivation takes a three-to-five-year time window from input to output, but its benefits cannot be exclusively occupied by enterprises, let alone included in quarterly financial reports. This mismatched structure of "benefits in the distance, costs in the present" makes industry-education integration always at the edge of enterprise internal resource allocation, becoming a "non-core cost" prioritized by management.

The resulting behavioral alienation is that enterprises present a typical short-term characteristic of "participating at both ends and absent in the middle" in industry-education integration: enterprises make high-profile appearances in the enrollment link to obtain brand exposure, and actively provide posts in the

graduation stage to solve urgent employment needs, but their participation in core links such as skill cultivation and quality improvement of students during school is extremely low. Under the yardstick of short-term performance, industrial decisions increasingly obey the valuation logic of the financial market, "people" are reduced to replaceable "production factors" at any time, and industry-education integration thus loses the most critical procedural participation, reduced to a "ritual cooperation" with only a starting point and an end point. This is the "patience dilemma" spawned by the lack of "patient capital" in the capital market—enterprises are not unwilling to cultivate talents, but the capital logic deprives them of the patience to "wait for flowers to bloom".

4. Long-Term Approaches: Path Optimization for Enterprises to Participate in Industry-Education Integration Under Digital Transformation

The "patience dilemma" of enterprises participating in industry-education integration does not stem from their strategic myopia, but a rational adaptive choice made by enterprises under the existing institutional structure. The solution lies not in reversing enterprises' short-term preferences, but in reconstructing an institutional environment compatible with incentives, making long-term talent cultivation the optimal choice in line with enterprise interests. By straightening out the institutional support for enterprises' long-term investment, repairing the market ecology of skill formation, and strengthening the value return of educational behavior, we will promote industry-education integration from short-term cooperation to stable symbiosis, and provide a structured solution for enterprises' deep and lasting participation.

4.1. Patency Realization: Support for Input, Guarantee for Process and Expectation for Benefit

The compression of technological iteration cycle and the multi-dimensional differentiation of technological routes put enterprises in a prisoner's dilemma of long investment cycle, short return window, difficult direction selection and high trial-and-error cost. In this regard, a full-chain buffer mechanism is built from the three ends of input, process and benefit to enable enterprises' financial models to span the technological iteration cycle and inject predictable institutional guarantees into long-term human capital investment.

At the input end, a long-term financing support mechanism matching the long education cycle is constructed. Financial institutions are encouraged to develop exclusive financial products for industry-education integration projects, allowing enterprises to apply for medium and long-term low-interest loans with financial discounting by pledging expected income such as technology transformation income signed with colleges and universities, so that enterprises can "afford to invest and

wait".

At the process end, a trinity risk resolution mechanism of "compensation + circulation + training" is created. Aiming at the problem that enterprise-specific assets are easy to depreciate due to technological iteration, a financial-backed technological iteration risk reserve fund is set up to compensate the sunk cost of assets invalidated due to technological route change according to standards. Relying on industry associations to build a cross-enterprise resource circulation platform, residual value evaluation, secondary development and allocation and circulation of training equipment and other resources with remaining value are carried out within the alliance. A special training program for teachers' skill transfer is set up to provide paid further study subsidies for enterprise mentors and college teachers on new technological routes. Through "compensation to cover sunk costs, circulation to activate residual value, and training to support capacity migration", the dilemma of "dare not invest" for enterprises in the face of technological uncertainty is solved.

At the benefit end, a stepwise increasing incentive based on cooperation years is implemented. Based on the value orientation of enterprises' long-term participation, a gradient incentive mechanism of "longer cooperation years, greater support" is implemented. For enterprises that have cooperated stably for more than 5 years and deeply participated in the whole process of talent cultivation, the subsidy amount is increased, tax reduction and exemption are increased, projects are prioritized for approval, and they are preferentially given seats in industry skill standard formulation and municipal industry-education integration union governance, substantially transforming patience into quantifiable long-term benefits.

4.2. Ecological Balance: Cost for Free Riding, Return for Education and Path for Development

The essence of the gig economy is that enterprises externalize the systematic cost of talent cultivation to society and internalize the economic benefits of skill use to themselves. When "only using talents but not cultivating them" becomes a common choice in the industry, enterprises essentially cut off the skill supply foundation needed for their own sustainable development. The key to correcting enterprise behavior lies not in denying the efficiency value of the gig economy, but in reconstructing the economic rationality of talent cultivation. Accordingly, specific measures can be taken from two aspects:

First, correct the cost imbalance between "cultivation" and "non-cultivation" through the collection and return mechanism of "skill ecology construction fee". A special fee is levied on enterprises that use a large number of gig workers and do not provide promotion channels according to their employment scale. The funds are directed into the skill ecology to subsidize enterprises or industry organizations carrying out long-cycle school-enterprise joint training, which not only implements the fair principle of "who benefits, who shares" but also makes "non-cultivating"

enterprises indirectly feed back the cultivation system.

Second, create a storage and exchange mechanism of "skill module package" and "credit bank" to open up the institutional channel between short-term training and long-term accumulation. Relying on the school-enterprise cooperation platform, with the task demand of gig jobs as the core guidance, systematically develop targeted, modular and combinable "skill module packages", so that gig practitioners in need of re-education can choose courses on demand according to their own career development needs and enterprise phased employment standards, realizing precise docking between skill supply and post demand. In terms of training cost sharing, a tripartite sharing system of "enterprise bearing as the main, government subsidy as the auxiliary, individual small sharing" is established, and it is clear that enterprises that have shared training costs can offset their payable "skill ecology construction fee" to avoid repeated collection. At the same time, taking the national qualification framework and credit bank as the core institutional carrier, the lifelong accumulation and academic equivalent conversion of training achievements are realized at the institutional level.

Thus, gig practitioners can realize the leap from "task-based labor" to "skill-based employment", solving the dilemma of "skills not recognized and no room for development"; enterprises can also shift from the short-term thinking of "instant procurement" of gig labor to long-term investment layout of human capital, so as to realize the in-depth reconstruction of the human resource market in the dynamic adaptation of people and technology.

4.3. Value Transformation: Realizable Credit, Appreciated Assets and Rewarded Talents

The root cause of enterprises' short-term behavior lies in regarding talent cultivation as "external public welfare" unrelated to core business. The key to solving this dilemma lies in deeply binding educational contribution with enterprises' market reputation, asset value and core talent reserve, making "talent cultivation" an organic part of enterprise competitiveness.

First, build a linking mechanism between "educational contribution credit" and market access to transform "educational responsibility" into "market advantage". A national networked enterprise industry-education integration educational contribution file is established, and data such as enterprises' investment records in talent cultivation, training quality and technological achievement transformation effectiveness are uploaded to the chain for storage. Enterprises with outstanding educational contributions are given substantial additional weight in government procurement, major project bidding and industrial support fund allocation; restrictive measures such as credit deduction and policy restrictions are imposed on enterprises with formal cooperation of "participating at both ends and absent in the middle" to force enterprises to standardize their participation behavior. Through

credit leverage, educational contribution is transformed into enterprises' market competitiveness, so that active talent-cultivating enterprises can obtain tangible "reputation premium" in market competition.

Second, clarify the asset confirmation of all subjects to transform "educational achievements" into "enterprise assets". Based on the whole process of collaborative education, improve the property right definition mechanism of school-enterprise cooperation achievements, and clarify enterprises' rights and interests in the development of courses, standards and certification systems. Digitized teaching resources and tools formed jointly are legally granted intellectual property rights to enterprises, and support their entry into the account, circulation and financing as intangible assets. When "educational achievements" have the same asset attributes as technological patents, reducing training costs is equivalent to compressing their own assets.

Third, release talent vitality through property right incentives to transform "talent value" into "equity income". For industrial professors and skill masters dispatched by enterprises to colleges and universities, clarify their intellectual property shares in technological innovation, process improvement, standard formulation and other achievements generated in the cooperation process, establish a diversified income distribution mechanism, and allow them to obtain continuous returns through technology investment, achievement transfer, patent authorization and other ways. When the time investment of enterprise talents can be transformed into tradable capital returns, deep participation in industry-education integration will no longer be an additional burden for enterprises, but an important strategic channel for enterprises to build a high-quality talent echelon, accumulate core technologies and realize value creation.

5. Conclusion

The most dangerous illusion in the digital age is to believe that everything can be optimized by algorithms and conquered by speed. However, the essence of education is precisely to disenchant this illusion. It stubbornly reminds us that the growth of talents has its incompressible rhythm, and the precipitation of skills has its unavoidable process. Leave space for "slowness" in the noise of supremacy of efficiency; inject expectation for "long-term" into the torrent of short-termism. Only in this way can industry-education integration truly become a solid bridge supporting industrial iteration and talent growth, rather than a fleeting "ritual conspiracy" in the tide of the times.

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