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# Interdisciplinary Innovation Talent Cultivation: Collaborative Mechanisms and Practical Pathways in the Era of New Quality Productive Forces

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**Abstract:** Rapid advances in artificial intelligence, big data, and digital technologies are reshaping industrial development and creating growing demand for interdisciplinary innovative talents. However, many universities still face problems such as fragmented curricula, insufficient collaboration with industry, and outdated evaluation systems. Based on these practical challenges, this paper examines collaborative education mechanisms and discusses how curriculum reform, organizational innovation, and dynamic evaluation systems can better support talent development in the era of new quality productive forces.

**Keywords:** Innovative Talent Development; New Quality Productive Forces; Collaborative Mechanisms; Practical Pathways.

## 1. Introduction

Recent breakthroughs in artificial intelligence, big data, cloud computing, and intelligent manufacturing are rapidly reshaping traditional economic development models. Industrial transformation is increasingly driven by technological innovation, digitalization, and knowledge-intensive production. In this context, the concept of new quality productive forces has attracted widespread attention in both academic research and national development strategies. Compared with traditional productivity models that rely heavily on labor and resource inputs, new quality productive forces emphasize technological breakthroughs, industrial upgrading, and sustainable development supported by high-level innovative talents [1].

Talent plays a central role in the development of new quality productive forces. Emerging industries require professionals who not only possess strong disciplinary expertise but are also capable of interdisciplinary collaboration, technological adaptation, and practical innovation. In particular, the rapid integration of artificial intelligence into various industries has created urgent demand for talents who can combine intelligent technologies with domain-specific knowledge. As a result, higher education institutions are under increasing pressure to reform traditional talent cultivation models.

However, many universities still face significant challenges in responding to these changes. Traditional disciplinary boundaries remain deeply embedded in curriculum systems, making interdisciplinary integration difficult to implement. In addition, uneven educational resources, limited cooperation between universities and industries, and outdated evaluation mechanisms further weaken the effectiveness of talent cultivation. Many educational programs continue to emphasize theoretical learning while neglecting practical innovation and real-world problem solving.

To address these challenges, universities have gradually explored interdisciplinary education models that integrate artificial intelligence with different academic fields. These models aim to cultivate students with both technological literacy and interdisciplinary problem-solving abilities. Meanwhile, collaborative education involving universities, enterprises, governments, and research institutions has become an important pathway for improving talent cultivation quality.

Based on the background of new quality productive forces, this paper examines the challenges faced by interdisciplinary innovative talent development and discusses collaborative mechanisms for improving educational effectiveness. It further explores practical pathways from the perspectives of curriculum integration, organizational innovation, and evaluation system reform..

## 2. The AI-Integrated Interdisciplinary Education Model

The rapid development of artificial intelligence technologies has accelerated industrial transformation and continuously reshaped talent demand in the digital economy. Traditional higher education models, which are usually organized around relatively independent disciplinary systems, are increasingly struggling to meet the needs of emerging industries. Modern industries require graduates who not only possess solid professional knowledge, but also demonstrate interdisciplinary thinking, technological adaptability, and innovation capabilities. Against this background, universities have gradually begun exploring interdisciplinary education models that integrate artificial intelligence with different academic fields.

Compared with traditional talent cultivation approaches, AI-integrated interdisciplinary education emphasizes the reconstruction of knowledge systems, innovation of teaching models, and stronger connections between education and industrial practice. It aims to cultivate students who can understand both intelligent technologies and domain-specific applications, enabling them to respond more effectively to industrial transformation and technological change. Based on differences in disciplinary foundations and educational objectives, two representative development models have gradually emerged in higher education practice.

## 2.1. The "AI+" Empowerment Model based on Disciplinary Integration

This model is primarily oriented toward engineering and information-related disciplines, where students typically possess stronger technical foundations. Instead of abandoning traditional disciplinary systems, universities integrate artificial intelligence technologies into existing curricula to promote deeper disciplinary upgrading.

In practical teaching reform, traditional courses such as computer science, software engineering, communication engineering, automation, and data science are increasingly combined with emerging subjects such as machine learning, deep learning, intelligent systems, cloud computing, and big data analytic. Through curriculum restructuring, students are expected to build stronger connections between foundational engineering knowledge and intelligent technologies.

For example, engineering students may learn how machine learning algorithms can optimize communication systems, improve intelligent manufacturing processes, or support data-driven decision-making. This integration helps students develop stronger abilities to solve complex engineering problems in real industrial environments.

In addition to curriculum reform, universities are increasingly introducing project-based learning approaches to improve students' practical abilities. Students participate in innovation competitions, interdisciplinary laboratory projects, academic research programs, and entrepreneurial activities, which help bridge the gap between theoretical learning and practical application.

Collaboration with enterprises and research institutions also plays an important role in this model. Through joint laboratories, internship programs, enterprise mentorship, and technology innovation platforms, students gain opportunities to engage with real industrial problems and understand current technological development trends.

Furthermore, some universities have established interdisciplinary innovation centers and future technology institutes to promote resource sharing across departments. These institutions help reduce traditional disciplinary barriers and provide stronger institutional support for AI-integrated education reform.

Overall, this model is particularly suitable for cultivating engineering-oriented talents who can adapt to technological change, participate in industrial upgrading, and contribute to the development of new quality productive forces..

## 2.2. The AI-integrated Minor Model based on Interdisciplinary Collaboration

Unlike the previous model, this approach mainly targets students from non-technical disciplines such as finance, economics, law, healthcare, education, agriculture, and the humanities. The primary goal is not to transform these students into AI engineers, but to help them understand how intelligent technologies can be integrated into their own professional fields.

As artificial intelligence increasingly influences social governance, financial services, healthcare systems, legal services, and cultural industries, non-technical professionals are also expected to possess basic digital literacy and technological awareness. This has created growing demand for interdisciplinary education models that combine professional knowledge with intelligent technology applications.

Under this model, students are typically introduced to foundational content such as data analysis, computational thinking, intelligent decision-making, algorithm awareness, and digital platform applications, while maintaining strong disciplinary expertise in their original fields. For example, finance students may learn intelligent risk control systems and financial data analysis, law students may explore algorithm governance and digital regulation, while healthcare students may study intelligent diagnosis systems and medical data management.

To improve flexibility, many universities have introduced innovative teaching approaches such as SPOC courses, micro-majors, modular curricula, blended learning systems, and interdisciplinary elective platforms. These approaches allow students to choose personalized learning paths according to their interests, career plans, and industry needs.

Practical learning is also emphasized in this model. Through enterprise internships, interdisciplinary innovation projects, entrepreneurship programs, and real-world case studies, students are encouraged to explore how artificial intelligence can solve practical problems in different industries.

Compared with traditional discipline-centered education models, this approach provides greater flexibility, broader participation opportunities, and stronger alignment with the diversified talent demands created by new quality productive forces.

# 3. Challenges in the Multi-Stakeholder Empowerment of Interdisciplinary AI Education

The development of interdisciplinary AI education requires cooperation among universities, enterprises, governments, research institutions, and social organizations. Compared with traditional single-subject education models, this collaborative model involves more stakeholders, more complex resource coordination, and higher institutional requirements. Although multi-stakeholder collaboration creates new opportunities for improving educational quality and innovation capacity, it also faces a series of practical challenges during implementation.

These challenges are reflected not only in curriculum integration and resource allocation, but also in organizational coordination, institutional incentives, and evaluation systems. If these structural barriers cannot be effectively addressed, interdisciplinary education may remain at the level of superficial cooperation rather than generating sustainable innovation outcomes.

## 3.1. Structural Contradictions in Interdisciplinary Integration

One of the most significant challenges lies in the structural contradictions created by interdisciplinary integration. Traditional universities are largely organized according to relatively independent disciplinary systems, where departments often operate with clear administrative boundaries, separate curriculum structures, and independent faculty allocation systems. Such organizational arrangements make interdisciplinary collaboration difficult to implement in practice.

The first challenge involves the fragmentation of knowledge systems. Artificial intelligence education requires the integration of computing knowledge with domain-specific

expertise, yet many universities still struggle to create coherent curriculum connections between these areas. Students may complete multiple courses from different disciplines without truly developing interdisciplinary problem-solving capabilities.

The second challenge concerns curriculum balance. Universities often face difficulties in determining how much AI-related content should be introduced into traditional disciplinary programs. Excessive emphasis on intelligent technologies may weaken students' foundational disciplinary training, while insufficient AI exposure may reduce graduates' competitiveness in emerging labor markets.

A third challenge involves personalized learning pathways. Students increasingly expect flexible learning opportunities that match their personal interests and career goals. However, many universities still rely on rigid curriculum systems that limit cross-disciplinary course selection and individualized development.

In addition, practical training resources remain unevenly distributed. Leading universities often possess stronger faculty teams, better laboratories, and more advanced digital learning platforms, while many local institutions face significant shortages in both teaching resources and practical training opportunities. This imbalance further widens the gap in interdisciplinary talent cultivation outcomes.

Without deeper institutional reform, interdisciplinary education may struggle to move beyond symbolic curriculum adjustments toward substantial innovation in talent development.

### 3.2. Systemic Barriers to Collaborative Talent Development

Effective collaboration among universities, enterprises, governments, and research institutions remains another major challenge. Although all stakeholders recognize the importance of interdisciplinary talent development, their priorities often differ significantly.

Universities typically prioritize academic performance, disciplinary development, and teaching quality. Enterprises tend to focus on short-term labor market demands and practical skill development. Government agencies often emphasize policy implementation, regional development goals, and broader social benefits. These differences frequently create conflicts in cooperation objectives.

For example, enterprises may expect universities to produce graduates who can quickly adapt to workplace requirements, while universities may place greater emphasis on theoretical education and long-term academic development. This mismatch often weakens the effectiveness of collaborative education programs.

Resource allocation also creates additional barriers. Small and medium-sized enterprises may lack sufficient funding to participate deeply in university partnerships, while some universities may lack the financial resources required to build advanced interdisciplinary teaching platforms.

Information asymmetry further reduces collaboration efficiency. Universities may not fully understand changing industrial talent demands, while enterprises often have limited knowledge of academic training processes. As a result, feedback mechanisms remain weak and curriculum reform may lag behind market changes.

Moreover, many collaborative projects lack long-term institutional guarantees. Cooperation often depends on short-term projects or temporary policy incentives rather than stable governance mechanisms, which limits sustainability.

### 3.3. Challenges in Educational Evaluation Alignment

Evaluation systems remain another major obstacle in interdisciplinary AI education reform. Traditional higher education evaluation models often emphasize examination scores, publication outputs, and short-term academic indicators. However, these indicators are often insufficient for measuring interdisciplinary learning outcomes.

For example, students' creativity, interdisciplinary communication skills, entrepreneurial capacity, and practical innovation abilities are often difficult to assess through traditional evaluation methods.

At the institutional level, universities are frequently evaluated according to discipline rankings, publication performance, and graduation statistics, which may discourage long-term interdisciplinary experimentation.

In collaborative education programs, evaluation standards among universities, enterprises, and governments are often inconsistent. Enterprises may emphasize practical skills, universities may prioritize academic achievement, and governments may focus on policy outcomes. These inconsistent standards create coordination difficulties.

In addition, delayed feedback mechanisms remain a common problem. Many institutions evaluate educational outcomes only after students graduate, which makes it difficult to identify problems during the learning process.

With the rapid development of artificial intelligence technologies, traditional evaluation approaches are becoming increasingly inadequate. More dynamic, process-oriented, and multi-stakeholder evaluation systems are urgently needed to support sustainable interdisciplinary education reform..

## 4. Strategies for Building Collaborative Talent Development Mechanisms and Ecosystems through Cross-Boundary Integration

To respond to rapid technological transformation and the growing demand for interdisciplinary talents, universities have gradually explored collaborative education models that integrate artificial intelligence with multiple disciplines. Compared with traditional talent cultivation approaches, this model relies more heavily on cross-boundary cooperation among universities, enterprises, research institutions, and governments. The effectiveness of interdisciplinary education depends not only on curriculum reform, but also on whether a stable collaborative ecosystem can be established.

In practice, collaborative education requires the integration of knowledge resources, teaching resources, organizational support, and external industry participation. Universities remain responsible for disciplinary education and academic training, enterprises contribute practical application scenarios and technical demands, while research institutions provide technological innovation support. Government agencies also play an important role in policy guidance and resource coordination.

Rather than relying on temporary cooperation projects, interdisciplinary talent development requires long-term collaborative mechanisms that allow different stakeholders to share resources, align development goals, and improve educational efficiency. Figure 1 illustrates the general framework of interdisciplinary collaborative education..

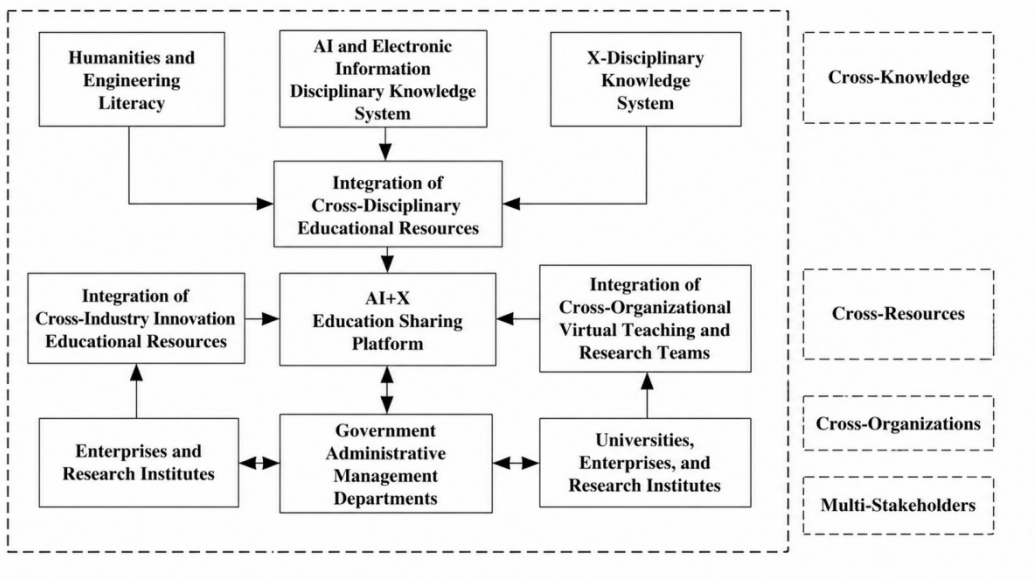



**Fig 1.** Interdisciplinary and Cross-Boundary Integrated AI Education Model

## 4.1. Collaborative Implementation of Talent Development

### 4.1.1. Mechanisms for Interdisciplinary Integration

Interdisciplinary talent development requires stronger integration between knowledge systems and practical learning. Universities need to redesign traditional curriculum structures and establish stronger links between artificial intelligence education and domain-specific knowledge.

This includes developing interdisciplinary courses, expanding project-based learning opportunities, and encouraging cooperation among faculty members from different disciplines. Under the Outcome-Based Education framework, continuous curriculum adjustment should be based on student learning outcomes and industrial demand changes.

Through stronger curriculum coordination and flexible teaching arrangements, universities can gradually improve students' interdisciplinary learning experiences.

### 4.1.2. Collaborative Talent Development System

Many universities still face challenges such as limited practical resources, weak industry participation, and fragmented cooperation mechanisms. To address these issues, long-term collaboration among governments, universities, enterprises, and research institutions is necessary.

Clear responsibility allocation, stable communication channels, and sustainable incentive systems are important for maintaining collaboration efficiency. At the same time, stakeholders need to establish common development goals to avoid conflicts caused by differing priorities.

A more open and flexible collaborative system can improve resource sharing and strengthen talent cultivation quality.

### 4.1.3. Collaborative Evaluation System

Evaluation mechanisms should adapt to the characteristics of interdisciplinary education. Traditional evaluation systems often focus too heavily on final academic results while ignoring practical performance and interdisciplinary competence.

A more comprehensive framework should consider curriculum quality, teaching resources, research outcomes, and student development performance. Dynamic feedback systems can help institutions identify problems earlier and improve educational effectiveness.

The CIPP model provides a useful framework for evaluating interdisciplinary education performance in a more systematic way.

## 4.2. Practical Pathways for Collaborative Talent Development

### 4.2.1. Building an Integrated Curriculum System

Curriculum reform remains one of the most direct ways to improve interdisciplinary talent development. Universities need to break traditional disciplinary boundaries and create stronger connections between theoretical learning and practical applications.

For engineering-related disciplines, AI knowledge can be integrated into traditional technical courses. For non-technical disciplines, flexible modules such as micro-majors, elective courses, and interdisciplinary certificates can provide students with broader learning opportunities.

A more flexible curriculum structure can better respond to changing industrial needs.

### 4.2.2. Developing Virtual Teaching and Research Organizations

Virtual teaching and research organizations provide new opportunities for cross-institutional collaboration. Through digital platforms, universities, enterprises, and research institutions can jointly develop teaching materials, research projects, and innovation programs.

This model reduces geographical limitations and improves resource sharing efficiency. It also creates more opportunities for students to access external expertise and practical learning resources. Long-term operational mechanisms remain essential for ensuring the sustainability of these organizations.

### 4.2.3. Optimizing the Performance Evaluation System

Traditional performance evaluation in higher education has long relied on indicators such as examination scores, graduation rates, and research achievements. While these measures remain important, they are not sufficient to assess the effectiveness of interdisciplinary AI talent cultivation. In particular, they often fail to capture students' practical competence, innovative thinking, and ability to work across disciplinary boundaries.

Under interdisciplinary training models, students are

expected to apply knowledge in complex real-world contexts rather than simply complete theoretical coursework. Their participation in innovation projects, academic competitions, enterprise internships, and collaborative research activities should therefore be considered as important evaluation dimensions. An evaluation model that focuses only on final outcomes cannot accurately reflect students' comprehensive development.

Another challenge lies in the inconsistency of evaluation standards among universities, enterprises, and government departments. Universities tend to prioritize academic achievement, enterprises place greater emphasis on practical capabilities and employability, while governments are more concerned with policy effectiveness and broader social impact. These differing priorities may weaken the coordination efficiency of collaborative education programs.

To improve this situation, universities should establish a more flexible evaluation mechanism that integrates both process-based and outcome-based assessment. Indicators such as learning engagement, curriculum quality, enterprise involvement, and graduate employment performance should be incorporated into the evaluation framework. [4-5]

The combination of the CIPP model and Analytic Hierarchy Process offers a practical method for optimizing evaluation systems. At the same time, digital tools can help universities build student development records and strengthen feedback systems, enabling talent cultivation programs to better adapt to evolving industrial demands.

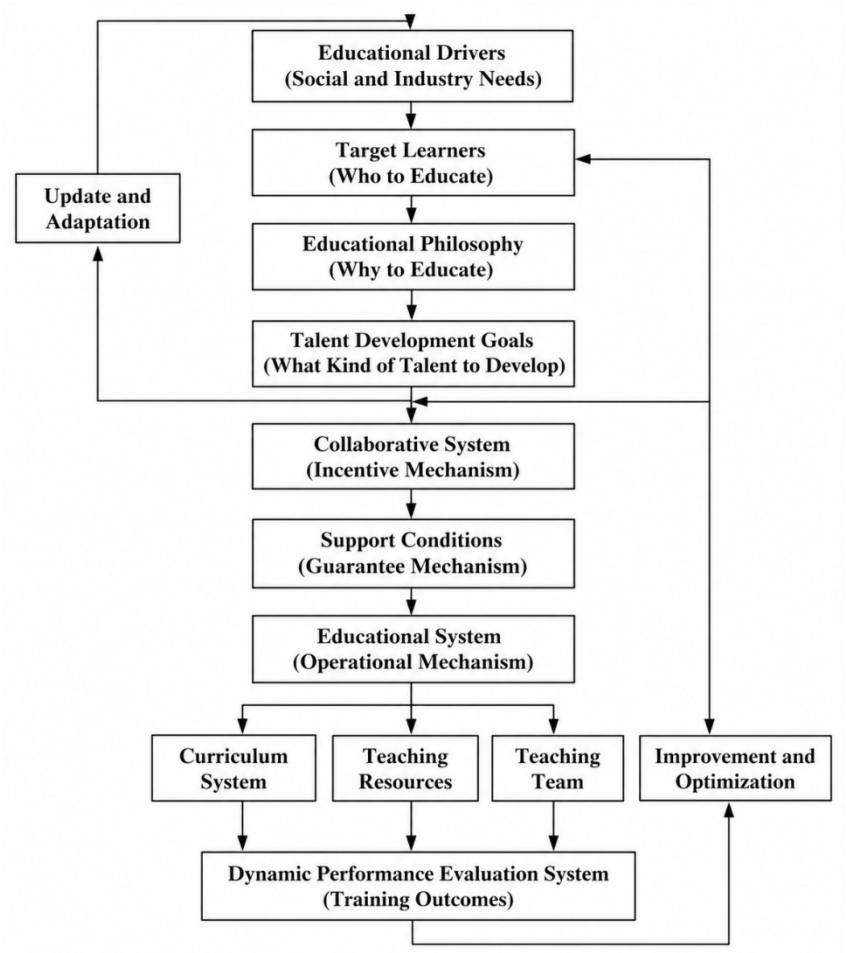



**Fig 2.** Optimization Framework of Collaborative Education Mechanism Based on CIPP-AHP Dynamic Performance Evaluation

# 5. Summary

Driven by the growing demand for innovative talent under the development of new quality productive forces, this paper examines interdisciplinary AI education and explores how collaborative mechanisms influence talent cultivation, as well as the challenges encountered in practice. The analysis shows that interdisciplinary programs still face problems such as fragmented curriculum structures, weak coordination among stakeholders, and mismatches in evaluation standards.

To respond to these issues, this paper proposes the construction of a collaborative educational ecosystem based on cross-boundary integration. Practical approaches are discussed from several dimensions, including curriculum restructuring, the establishment of virtual teaching and research organizations, and the improvement of performance evaluation mechanisms. These measures aim to enhance coordination among universities, enterprises, and government agencies while improving the quality of interdisciplinary talent development.

Overall, the study offers both theoretical insights and practical references for improving AI-related interdisciplinary education and supporting innovative talent cultivation in the context of emerging productive forces.

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# References


[1] Song F X, Wang L. The contemporary significance, practical concerns, and future actions of cultivating top innovative talents under the background of new quality productive forces[J]. Journal of Hebei Normal University (Philosophy and Social Sciences Edition), 2024, 47(3): 119–125.

[2] Wei Y S, Qiao Q D. Practical dilemmas and optimization strategies for cultivating top innovative talents in universities from the perspective of new quality productive forces[J]. Modern Education Management, 2024(12): 11–19.

[3] Cui Y D. Exploration of micro-major development paths from the perspective of emerging engineering education[J]. Journal of Nanjing University of Science and Technology (Social Sciences Edition), 2023, 36(3): 70–76.

[4] Wang J X, Duan G H, Liu J. Exploration and practice of the "Artificial Intelligence + X" graduate innovative talent cultivation model[J]. Education and Informatization Industry, 2021(10): 6–9, 30.

[5] Shen L Y, Jiao D L, Li G Q, et al. Research and practice of virtual teaching and research offices for "Artificial Intelligence + X" in emerging engineering education[J]. Journal of Jilin Engineering Normal University, 2022, 38(8): 69–74.