

# Research on the Reform of Teaching Models in Higher Education and the Cultivation of Digital-Intelligent Talent

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**Abstract:** Traditional higher education teaching models face delayed knowledge, monotonous methods, and disconnect from industry needs. This study proposes a “digital-intelligence-driven and four-chain-integrated” reform framework. A controlled experiment (92 students per group) shows the reform significantly improves digital-intelligent literacy (comprehensive index from 54.0 to 87.5). Countermeasures are suggested from curriculum, teaching, platform, and evaluation perspectives.

**Keywords:** Teaching Model Reform; Digital-Intelligent Talent Cultivation; Higher Education; Digital-Intelligent Literacy; Industry-Education Collaboration

## 1. Introduction

Digitalization and intelligence demand digital-intelligent talent, but traditional teaching models suffer from slow knowledge updates, one-way lecturing, and weak practice-evaluation links. Following a “status analysis-model construction-practice verification-countermeasure suggestions” logic, this study constructs a “digital-intelligence-driven and four-chain-integrated” reform framework and validates it through a controlled experiment, providing theoretical and practical references for higher education.

## 2. Theoretical Foundations and Reality Analysis

**Table 1. Analysis of the Practical Dilemmas in Teaching Model Reform and Digital-Intelligent Talent Cultivation in Higher Education**

Dimension of Dilemma	Specific Manifestations	Limitations of Traditional Teaching Models
Course Content	Delayed knowledge updating and insufficient integration of frontier developments	Lack of a dynamic reconstruction mechanism
Teaching Methods	Predominance of one-way lecturing and insufficient interaction	Lack of data-driven precision teaching
Practical Training	Disconnection between practical training and industrial needs	Lack of whole-chain integrated design
Evaluation Mechanism	Emphasis on knowledge memorization over competency outcomes	Difficulty in supporting competency-oriented cultivation

### 2.1 Connotations of Digital-Intelligent Talent and Teaching Model Reform

Digital-intelligent talent refers to compound talent capable of using digital technologies and intelligent methods to obtain and analyze data and solve complex real-world problems. Teaching model reform is the systematic reconstruction of teaching objectives, content, methods, organization, and evaluation based on digital-intelligent technologies, characterized by student-centeredness, competency-outcome orientation, and data support. Its empowerment goes beyond technology embedding; it reshapes the operational logic of teaching-learning-evaluation, enabling a transformation from knowledge-based to competency-based cultivation, from one-way transmission to collaborative construction, and from experience-based to data-driven decision-making.

### 2.2 Practical Dilemmas in Teaching Model Reform and Digital-Intelligent Talent Cultivation in Higher Education

According to the survey at a university, the dilemmas for the teaching model reform and the digital-intelligent talent cultivation can be expressed into the four dimensions in Table 1. These dilemmas are interrelated with each other. Updating the textbooks or adding the new courses are not enough to solve these dilemmas in the sense of the essence, but we have to do the systematic reconstruction in the level of the reform framework. It is urgent.

### 2.3 Mechanisms Through Which Teaching Model Reform Empowers Digital-Intelligent Talent Cultivation

Teaching model reform empowers cultivation through three mechanisms: reconstruction (dynamic content updating), collaboration (human-machine precision teaching), and integration (linking learning-practice-evaluation).

### 3. Construction of a Teaching Model Reform Framework for Digital-Intelligent Talent Cultivation

#### 3.1 Design Concepts and Principles

The construction of the model has four principles. First, the model is oriented to the output of core digital-intelligent literacy, so that the technology supports the goals of talent cultivating. Second, the construction follows on the data-driven approach, so that the teaching decision is based on data. Third, the construction emphasized in whole-chain integration, using the coordinations of the four chains to support the systematic development of the competencies. Fourth, the construction values the feasibility and scalability, so that the reform way of the path can be done in the fashion of stadia under the existing condition of the higher education institutions.

#### 3.2 The “Digital-Intelligence-Driven and Four-Chain-Integrated” Teaching Model Reform Framework

Based on the above mechanisms and principles, this paper constructs a “digital-intelligence-driven and four-chain-integrated” teaching model reform framework, as shown in Figure 1. At the technology empowerment level, artificial intelligence, big data, digital platforms, and virtual simulation provide the infrastructure. At the four-chain integration level, the curriculum chain builds a digital-intelligent knowledge system; the teaching chain achieves precision instruction through human-machine collaboration; the practice chain supports practical innovation with authentic projects; and the evaluation chain enables value-added assessment via data profiling. Driven by digital-intelligent technologies, the four chains are connected and coordinated, iterating through the pathway of initiation, deepening, integration, and maturity, thereby systematically improving the quality of digital-intelligent talent cultivation.

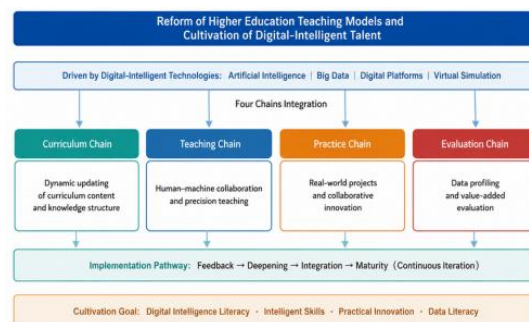


Figure 1. The “Digital-Intelligence-Driven and Four-Chain-Integrated” Teaching Model Reform Framework

#### 3.3 Key Support and Evaluation Model for Cultivation Effectiveness

In order to quantitatively get the effect of cultivation, in this study, the whole evaluation model of the development of the digital-intelligent talent is constructed. Let the comprehensive cultivation effectiveness index DDD of the is the weight combination of the digital-intelligent knowledge KKK, the intelligent skills SSS, the practical innovation PPP and the data literacy VVV, i.e.

$$D = w_1 \cdot K + w_2 \cdot S + w_3 \cdot P + w_4 \cdot V \quad (1)$$

Where  $w_1 \sim w_4$  are weight coefficients satisfying:  $w_1 + w_2 + w_3 + w_4 = 1$ , Based on expert consultation and calibration using the entropy weight method, this study sets  $w_1 = 0.25$ ,  $w_2 = 0.30$ ,  $w_3 = 0.30$ ,  $w_4 = 0.15$ , All sub-indicators are normalized to a range of 0~100. Furthermore, the growth of students’ digital-intelligent literacy across reform stages  $t$  can be characterized by a learning curve:

$$D(t) = D_{\max} \cdot (1 - e^{-\gamma t}) \quad (2)$$

Where  $D_{\max}$  represents the upper limit of cultivation effectiveness, and  $\gamma$  denotes the growth rate coefficient. Teaching model reform increases  $\gamma$  by enhancing the intensity of data-driven instruction and the level of practice-oriented collaboration. The value-added effect of cultivation is measured by the difference between pre- and post-reform comprehensive effectiveness:  $\Delta D = D_{\text{post}} - D_{\text{pre}}$ , which serves as the core indicator for evaluating the effectiveness of teaching model reform.

### 4. Teaching Practice and Effectiveness Analysis

#### 4.1 Practice Design and Sample

A five-stage controlled practice was conducted

among information-related majors at a university. From the same major and cohort, 92 students were assigned to the experimental group (implementing the proposed “digital-intelligence-driven and four-chain-integrated” teaching model) and 92 to the control group (traditional lecture-based model). Data were collected on literacy, project outcomes, platform logs, and interviews.

#### 4.2 Analysis of Cultivation Effectiveness

The comparison of the two groups across core dimensions of digital-intelligent literacy is given in Figure 2 after the completion of the reform. We can see that in six dimensions, i.e. digital-intelligent knowledge foundation, intelligent tool application, data analysis ability, practical innovation ability, interdisciplinary collaboration ability, and data ethics literacy, the experimental group is far ahead of the control group. Besides, the overall literacy structure also shows both large improvement and larger balance. It indicates that the teaching model reform can promote the systematic development of core digital-intelligent literacy.

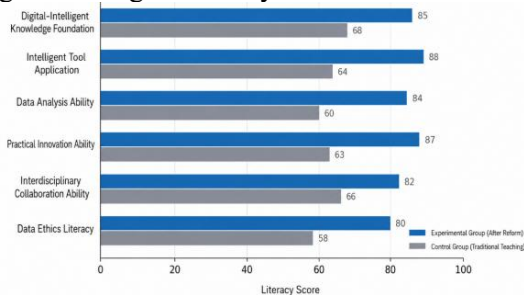


Figure 2. Comparison of Core Digital-Intelligent Literacy Dimensions Between the Experimental Group and the Control Group

Table 2. Comparison of Key Indicators Between the Experimental Group and the Control Group

Evaluation Indicator	Control Group	Experimental Group	Improvement
Comprehensive Talent Cultivation Index	63.5	87.5	+24.0
Overall Cultivation Effectiveness D	62.1	85.9	+23.8
Intelligent Skills Score	64.0	88.0	+24.0
Practical Innovation Score	63.0	87.0	+24.0
Excellent Project Rate (%)	10.9	29.3	+18.4

#### 4.3 Teacher and Student Feedback and Qualitative Analysis

Students found digital-intelligent courses cutting-edge and practical, with human-machine collaboration providing timely feedback and greater learning initiative. Teachers reported that data-based learner profiles improved precision and individualized teaching, while authentic

Figure 3 shows the changes of the comprehensive index of digital-intelligent talent cultivation across the reform stages for the two groups from the process perspective. From the figure, we can see that the comprehensive index of the experimental group increased from 54.0 at the stage of traditional, i.e. the baseline stage, to 87.5 at the stage of mature and stable, while that of the control group increased only from 54.0 to 63.5 during the period of the reform. The gap of the two groups has continued to become larger and larger as the reform went on. It means that the teaching model reform has an important and sustainable positive effect on the cultivation of the digital-intelligent talent.

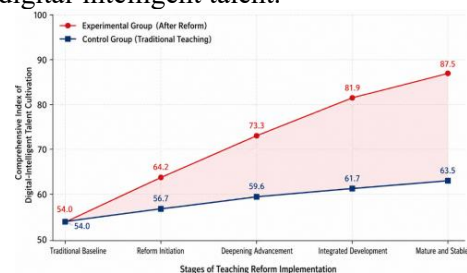


Figure 3. Evolution Curve of the Comprehensive Index of Digital-Intelligent Talent Cultivation Across Reform Stages

The comparison of the key comprehensive indicators is in Table 2. Generally, the experimental group is significantly better than the control group in these indicators: (1) the overall cultivation effectiveness, (2) intelligent skills, (3) the practical innovation, (4) the proportion of the excellent project result. Even more, the differences are significant at the level of  $p < 0.01$  of independent-samples t-test, and therefore we can claim that the effectiveness of the proposed reform model is proved.

projects strengthened practical innovation. Challenges included uneven access to quality resources and the need for further teacher training in data-driven instruction.

#### 5. Recommendations for Advancing Teaching Model Reform

Based on the practical results, four recommendations are proposed. First,

dynamically reconstruct the digital-intelligent curriculum system using a competency map to align content with industrial frontiers and form interdisciplinary course modules. Second, innovate data-driven teaching methods by promoting human-machine collaboration, blended and project-based learning, and precision teaching based on intelligent platforms. Third, strengthen platform and practice support through digital teaching platforms, virtual simulation environments, and industry-education collaborative bases with real projects and mentors. Fourth, improve the data-driven evaluation system using the comprehensive cultivation effectiveness model, incorporating process data, project outcomes, and data ethics, while reducing reliance on knowledge-based assessment. Additionally, reform should follow a phased implementation mechanism—pilot, evaluation, and gradual expansion—with dynamic monitoring for continuous improvement, adapted to institutional contexts.

## 6. Conclusions and Prospects

This study draws three main conclusions: (1) Teaching model reform overcomes the core dilemmas of out-dated knowledge, monotonous methods, and disconnected cultivation through reconstruction, collaboration, and integration mechanisms. (2) The “digital-intelligence-driven and four-chain-integrated” reform framework is operable and systematically develops core digital-intelligent literacy. (3) Controlled teaching practice shows significant and sustainable improvement in students’ comprehensive cultivation index (from 54.0 to 87.5) and all literacy dimensions. Future research should expand sample size and

disciplinary coverage, track long-term career development outcomes, and further integrate generative AI and industrial big data into the teaching process to promote more literacy- and value-inclusive evaluation models.

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