

# A Study on the Construction of Industry-Education Integrated Curriculum System Based on Artificial Intelligence

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**Abstract :** AI technology is reshaping industries, yet traditional industry-education integrated curricula face issues like outdated content, weak practical training, loose school-enterprise collaboration, and insufficient evaluation and faculty. Oriented to application-oriented universities, this study integrates OBE, CDIO and intelligent education to construct an AI-enabled curriculum system featuring “demand perception–module reconstruction–scenario empowerment–closed-loop evaluation”. It also designs a four-layer three-stage modular structure, a virtual-real integrated practical system, and a multi-agent intelligent evaluation mechanism, providing theoretical and practical support for digital transformation of industry-education integration.

**Keywords:** Artificial Intelligence; Industry-Education Integration; Curriculum System; OBE Concept; Application-Oriented Talent Training

## 1. Introduction

AI technology is driving the digital transformation of industries, and China has issued policies to promote AI-empowered industry-education integration. However, structural contradictions remain in current curricula: content lags behind AI advancements, practical teaching lacks real scenarios, school-enterprise cooperation is superficial, evaluation overemphasizes knowledge, and teachers lack AI literacy and industrial experience. These issues disconnect talent cultivation from industrial needs, so as to restrict the supply of talent for new quality productive forces. Thus, we need to construct a novel AI-enabled industry-education integrated curriculum system at all.

## 2. Practical Dilemmas of Industry-Education Integrated Curriculum System from the

## Perspective of Artificial Intelligence

### 2.1 Lagging Curriculum Content and Weak Practical Teaching

Traditional curricula are based on the disciplinary knowledge rather than the industrial demands. And the content is updated in slow, fragmentary AI integrated with the curricula and can not match the iteration of the technology. The module division is very rigid and the integration of the disciplines is insufficient, which can not meet the talent needs of the era of the “AI + Industry”. On the other hand, the teaching in practice is constraint in two directions. On one hand, the enterprises can not take the large scale on job training because of the consideration of security and confidentiality. On the other hand, the universities can not have the fund to deploy the advanced AI equipment. The virtual simulation is focused on the single skill training with low immersion in the moment. The teaching in practice is dominated by the confirmatory experiment rather than the real problem oriented project. Thus, the practical and innovative ability of students can not be developed<sup>[1]</sup>.

### 2.2 Loose School-Enterprise Collaboration and Lack of Long-Term Mechanisms

Most of the school-enterprise cooperation are just on the surface that the enterprises only give some internships and donate some equipments and rarely be involved in the core links such as curriculum designing and content making. Because of the low input-output ratio and there is no long-term benefit guarantee mechanism, enterprises do not have motivation to be sustained. The management system is not perfect, so the norm of the division of responsibility and communication coordination is very ambiguous. Besides, there is not demand docking mechanism so that the university can not get the real-time change in the competence of vocational. So it is delayed to update the curriculum.

### **2.3 Extensive Evaluation System and Inadequate Teacher Competence**

In the traditional evaluation system, the evaluation overemphasizes the theoretical knowledge while neglects the skills of practice and the invention. The participants of the evaluation are only the university teachers and there is no much participation of the enterprise mentor. The summative assessment is the dominant part, and there is no good formative evaluation and no intelligent tool to help the evaluation, so it is very low efficiency and strong subjectivity. Also, the teachers have no system of training in the AI tool and the experience of the front line industry, so the teaching design is impractical. The construction of the dual-qualified teachers is lags, and the incentives for the enterprise technical staff to participate in the teaching is imperfect. The training of the teacher focus on the theory rather than the application of the AI and the industrial practice, so the results is unsatisfactory<sup>[2-3]</sup>.

## **3. Construction of Artificial Intelligence-Based Industry-Education Integrated Curriculum System**

### **3.1 Overall Framework**

In this study, a closed-loop, four-in-one AI enabled industry-education integrated curriculum system of demand perception, module reconstruction, scenario empowerment and closed-loop evaluation is constructed. First, based on the AI big data platform and natural language process, the dynamic industrial vocational competency map is built and the talent demand can be accurately found. Second, based on the map and the university-enterprise collaboration, the modular structure of “four layer and three stage” integrates the AI general education, tool application, industrial practice and professional core content to make the curriculum of more and more precise and get the curriculum-job alignment. Third, the virtual-reality integrated practical teaching system which combines AI simulation platforms, joint training center and progressive project chain promotes the deep integration of theory and practice. Finally, the multi-agent, process-oriented intelligent evaluation mechanism can collect the whole-process learning data, generate the personalized competency portrait and use the evaluation result to iteratively adjust the

curriculum content and the teaching method, to form a self-updating closed loop of :evaluation-feedback-iteration.

### **3.2 “Four-Layer and Three-Stage” Modular Curriculum Structure**

#### **3.2.1 Four-Layer Curriculum Modules**

We target the cultivation of the interdisciplinary talent oriented to the point of “professional core competency + AI literacy”, and four progressive modules are designed, basic module, core module, expansion module and practical module. For the basic layer, to provide all the students AI general education, Python programming and AI ethics to cultivate the digital literacy. For the core layer, to cultivate the major integrated course for example, intelligent finance, smart logistics to match the core job competency. For the expansion layer, to open the topic about current cutting-edge topics, for example, the application of large model and digital twin to broaden the horizon and the thinking of innovation. For the practical layer, to construct the progressive chain from curriculum experiment to enterprise project and enterprise internship, to advance step by step from the skill of basic to the all the innovation.

#### **3.2.2 Three-Stage Progressive Competency Development**

According to the cultivation process following students’ cognitive rules, it is divided into three stages. In the cognitive initiation stage( the lower grades) , the basic-layer courses are pointed out, in which the basic cognition of AI and majors is firstly established. In the skill strengthening stage ( the middle grades), the core and expansion-layer courses are emphasized, and the project-based teaching and virtual simulation is adopted so that the skills of AI application is enhanced. In the comprehensive innovation stage ( the upper grades) led by expansion and practical-layer courses , the real enterprise project and on-the-job internship are introduced so that we can get a smooth transition from campus to workplace.

### **3.3 Virtual-Reality Integrated Practical Teaching System**

#### **3.3.1 AI Virtual Simulation Training Platform**

University-wide virtual simulation platforms are built with the support of AI, VR and AR technologies to restore industrial production scenarios and the operational processes of , with modules of basic skills, comprehensive projects

and emergency disposal. Students take part in the training in virtual roles, and in turn repeatedly practice the application of AI and the operation of equipments in a safe and low-cost environment, and make up for deficiencies of real training scenarios.

### 3.3.2 Joint School-Enterprise Training Centers

Universities and enterprises jointly invest in physical training centers. Enterprises provide advanced equipment, real production data and project resources, while universities offer venues and teaching organization. Built in accordance with enterprise workshop standards, the centers introduce real production procedures and management modes. Students participate in actual production projects under the on-site guidance of enterprise mentors, realizing synchronized teaching and production as well as targeted curriculum-job connection.

### 3.3.3 Progressive Project Chain

A progressive project chain covering mini curriculum projects, comprehensive projects, real enterprise projects and innovation & entrepreneurship projects is developed. Mini curriculum projects focus on basic skill training; comprehensive projects integrate multidisciplinary knowledge; real enterprise projects enhance on-the-job practical abilities; innovation and entrepreneurship projects cultivate innovative and entrepreneurial literacy. AI tools and methods are embedded throughout the whole project implementation process.

### 3.3.4 Integration Mechanism of Posts, Courses, Competitions and Certificates

Vocational standards, skill competition requirements and vocational qualification assessment contents are integrated into practical teaching. Curriculum content is adjusted in accordance with post standards and certificate syllabi; teaching methods simulate real workplace scenarios; evaluation criteria adopt post assessment and competition rules. After completing curricula and practical training, students can directly apply for vocational certificates and participate in professional competitions, realizing the mutual promotion among courses, posts, competitions and certificates.

## 3.4 Multi-Agent Intelligent Evaluation Mechanism

### 3.4.1 Diversified Evaluation Subjects

An all-round evaluation network is formed by integrating university teachers, enterprise

mentors, AI evaluation platforms, student self-evaluation and peer evaluation. University teachers assess theoretical knowledge and learning attitudes; enterprise mentors evaluate practical skills and job adaptability; AI platforms conduct objective formative assessment; self and peer evaluation foster students' reflective thinking and collaborative awareness.

### 3.4.2 Comprehensive Evaluation Dimensions

A four-dimensional evaluation indicator system covering knowledge, skills, literacy and innovation is established, with weighted indicators formulated according to professional and job demands. The knowledge dimension includes AI general knowledge, professional core theories and cutting-edge industrial knowledge; the skill dimension covers AI tool application, professional operation and project implementation capabilities; the literacy dimension involves professional ethics, collaboration and AI ethics awareness; the innovation dimension evaluates innovative thinking, project creativity and technological application innovation.

### 3.4.3 Process-Oriented Evaluation Methods

Relying on the intelligent AI evaluation platform, whole-process data such as online learning, assignment completion, experimental operation and project outcomes are collected and analyzed via machine learning algorithms to generate learning behavior portraits and provide real-time learning feedback. Combined with phased and summative assessment, the integration of formative and summative evaluation fully reflects students' learning progress and comprehensive performance<sup>[4]</sup>.

### 3.4.4 Intelligent Evaluation Feedback

Based on the evaluation data, the AI platform produces the personalized competency reports to make the students' strengths and weaknesses clear and give the learning suggestions. The evaluation results are not only for their academic grading, but also, reversely, the evaluation results are used to guide the curriculum adjustment, the training project optimization and the teaching method improvement. Through the closed loop of the evaluation - feedback - iteration, the curriculum quality and the talent training effectiveness are be improved continuously.

## 4. Conclusion and Prospect

In this study, by introducing the OBE, CDIO and intelligent education concepts, five major

dilemmas of traditional industry-education integrated curricula are addressed. In particular, it constructs a four-in-one AI enabled curriculum system with the modular structure of four-layer and three-stage, the virtual-real integrated practical teaching system and the multi-agent intelligent evaluation mechanism. It is a closed-loop construction path. It provides the theoretical and practical support for the application-oriented universities and vocational colleges to solve the problem of industry-education disconnection and talent mismatch.

Further research should also be done in the future in the applications of AI in the aspects of demand perception and teaching optimization, in bettering the school-enterprise collaborative mechanisms, in strengthening the teachers' AI literacy and industrial power. The personalized adjustments in the aspects of majors and colleges can make the reform experiences can be replicated, which can support the cultivation of high quality interdisciplinary talents and also inject new vitality into higher and vocational education.

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