

Research on the Mechanism, Path, and Practice of AI-Driven Precise Matching Between Industrial Demand and Educational Supply: A Case Study of Chaoxing Venus Major Construction System

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Abstract: The rapid development of new quality productive forces and the digital economy has driven continuous iteration and upgrading of posts in the intelligent manufacturing industry, raising the market's training standards for compound practical technical and skilled talents. At present, talent training in domestic vocational colleges generally suffers from a variety of supply-demand mismatches, mainly manifested as delayed perception of industrial demands, ambiguous post competency standards, lagging updating of curriculum systems, and rigid talent training programs. Traditional docking modes relying on manual research and school-enterprise forums can no longer adapt to the dynamic development needs of industries. Adopting action research, enterprise investigation, and case analysis as research methods, this paper takes the Chaoxing Venus Post Competency Mapping System as a practical carrier to explore the practical path of industry-education integration empowered by artificial intelligence. Supported by the digital functions of the platform, this study breaks down information barriers between industry and education, clarifies the operational mechanism of AI-enabled precise industry-education matching, and disassembles standardized implementation procedures. Practices show that this digital model can effectively resolve the disconnection in industry-education integration and provide operable references for vocational colleges to realize industry-education supply-demand matching and dynamic major adjustment.

Keywords: AI; Matching of industry-education supply and demand; Post competency map; Integration of industry and education; Vocational undergraduate education

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1. Introduction

Currently, China's industries are accelerating their transformation toward high-end, intelligent, and green development, generating an urgent all-round demand for technical and skilled talents in terms of scale, structure, and quality ^[1]. A series of top-level policy documents issued by the state, including the *Opinions on*

Promoting the High-Quality Development of Modern Vocational Education, Vocational Education Law, Plan for Building High-Level Vocational Colleges and Majors with Chinese Characteristics (2025–2029), Outline for Building a Powerful Country through Education (2024–2035), Action Plan for “Artificial Intelligence + Education,” and *National Vocational Education Teaching Standards*, clearly require vocational education to be guided by industrial demands, centered on post competencies, and supported by digitalization. These policies aim to effectively connect the education chain, talent chain, industrial chain, and innovation chain ^[2,3], establish a regular dynamic adjustment mechanism for talent training that caters to industrial post demands, and realize synchronized development between talent cultivation and industrial progress.

In recent years, domestic academic circles have conducted extensive research on digital-enabled industry-education integration and the construction of post competency maps. Qi *et al.* proposed that the reconstruction of the industry-education governance system serves as core support to achieve precise matching of industrial demands and multi-stakeholder collaborative sharing. They systematically sorted out the internal logic of artificial intelligence reshaping industry-education integration, and pointed out that intelligent technologies can reconstruct the whole process of major construction, curriculum development, and teaching evaluation. However, their research leans toward macroscopic theoretical deduction and lacks supporting complete landing cases of commercial digital platforms ^[4]. Li discussed three logics followed by dynamic major adjustment: technological development logic, external social demand logic, and major self-development logic. He argued that the essence of dynamic major adjustment lies in the coupling of the three logics, focused on the logic of big data supporting dynamic major adjustment, and demonstrated the value of digital data in optimizing major layout, yet failed to elaborate operable procedures for AI to decompose post competencies and connect curriculum systems ^[5]. Miao *et al.* found that vocational colleges are constructing major competency maps based on vocational post demands, but frequently encounter problems such as disconnection between competencies and post requirements, unclear construction logic, unscientific application scenarios, and ambiguous competency attainment levels during construction. They proposed building competency maps based on post demands and verified that such maps act as a core carrier linking industrial demands and teaching content, without forming a complete closed-loop analysis covering “demand collection–intelligent modeling–teaching implementation–dynamic iteration” ^[6]. Zhao and Yu explored the application of generative AI in classroom teaching, yet paid little attention to scenarios where AI supports top-level major construction and revision of talent training programs in colleges ^[7]. Wei *et al.* analyzed deep-seated supply-demand contradictions between vocational undergraduate education and industrial demands from a systematic governance perspective. Through literature analysis, typical case studies, and verification of industry-education integration practices, they analyzed the formation mechanism of supply-demand mismatches from three dimensions: curriculum teaching, industry-education collaboration, and school-running positioning. Nevertheless, their research mainly sorted out the causes of contradictions, failed to build a quantifiable evaluation framework for supply-demand matching, and lacked long-term operation schemes for dynamically adjusting talent training systems amid the high-end, intelligent, and green transformation of industries ^[8]. Chen, guided by industry-education integration theory, took the “Yidian Animation Order Class” as a case to construct and practice a collaborative talent cultivation mechanism of “demand perception–dual-subject co-cultivation–AI evaluation–data feedback.” By virtue of real projects and dual-tutor systems, AI tools are adopted to realize precise diagnosis of learning conditions and drive dynamic curriculum optimization. Still, the research focuses on closed-loop design of education procedures,

fails to establish a long-term constraint mechanism for the rights and responsibilities of school and enterprise entities, and lacks in-depth discussion on how AI evaluation data can be converted into adjustment bases for major talent training ^[9]. Most existing studies focus on theoretical mechanism analysis, with insufficient platform-based practical research that can be directly replicated and fit the actual management of colleges.

2. Existing supply-demand problems between industry and education in private vocational undergraduate colleges

In reality, vocational undergraduate education faces multiple challenges: major setup lags behind industrial development, curriculum contents are disconnected from enterprise technical standards, practical teaching systems are imperfect, and school-enterprise collaboration mechanisms are loose ^[8]. The revision of major settings and talent training programs in some vocational colleges mainly relies on teachers' experience and existing campus faculty and equipment. Practical dilemmas, including teaching content falling behind industrial technological iteration, training resources failing to adapt to digital and intelligent production scenarios, and insufficient digital teaching capabilities of teachers, not only restrict the quality of technical and skilled talent training, but also hinder precise matching between vocational education and industrial demands ^[10]. Industrial demand research mainly relies on enterprise field visits, industry forums, and questionnaires, which feature long research cycles, narrow coverage, highly subjective data, and slow updating speed, making it impossible to capture adjustments in post skills rapidly and accurately. This leads to persistent supply-demand conflicts between schools and enterprises: enterprises constantly suffer from difficulties in recruiting workers, poor employee-post matching, and high pre-job training costs, while college graduates face employment difficulties, low post matching degree, and limited career advancement space. Structural mismatches between industry and education restrict the connotative construction quality of vocational education.

3. Underlying operational logic of AI regulating industry-education supply-demand matching

AI-driven precise industry-education matching builds a full-chain closed-loop system of “data perception–intelligent analysis–mapping modeling–teaching implementation–dynamic iteration” based on multi-source industrial data. It systematically resolves the separation between industry and education from four dimensions: talent demand analysis, transformation of post competency standards, major talent training, and feedback on talent training quality.

3.1. Eliminating information asymmetry between schools and enterprises through full-range talent demand perception and analysis via AI digital platforms

Traditional manual research has obvious limitations: high cost, long cycles, limited coverage, and strong subjective bias in collected employment demand information. AI digital platforms construct a comprehensive, real-time, and refined demand perception system to fundamentally break information barriers between schools and enterprises. Through multi-source data collection, the platform integrates post information from mainstream national recruitment platforms, industrial statistical data released by local government departments, technical standards issued by industries and enterprises, and field survey materials from school-enterprise cooperative enterprises, building a dynamic demand database covering industries,

regions, and posts. Via dynamic monitoring, the platform continuously captures recruitment volume, core skill requirements, salary fluctuations, and enterprise employment preferences, and synchronously updates information on emerging and eliminated posts in real time. Multi-dimensional cross-intelligent decomposition and classified statistics by major categories, segmented posts, regions, academic qualifications, working years, and enterprise scales enable intuitive analysis of the structural employment demands of regional industries. Algorithm models analyze changing patterns of post demands over the past three years to predict scarce technologies and obsolete skills in the next 1–2 years, providing forward-looking data support for vocational colleges to add, cancel, upgrade, or reconstruct majors.

3.2. Conducting intelligent modeling analysis of post competencies via AI digital platforms to unify talent training standards of schools and enterprises and resolve inconsistent competency standards between post requirements and talent cultivation

The long-standing structural supply-demand contradiction in vocational education primarily stems from the failure to convert dynamically updated industrial post competency standards into unified education benchmarks, and the lack of clear, implementable competency maps for various emerging technical posts ^[11]. Recruitment information released by enterprises lacks standardized, teachable, and evaluable competency frameworks, making it difficult for teachers to directly translate such information into curriculum content and training projects. Supported by machine learning algorithms, AI technology can convert scattered enterprise employment requirements into a structured, visualized, and quantifiable standardized competency system. Through three-dimensional hierarchical decomposition, post competencies are divided into three dimensions: professional technical ability, comprehensive professional literacy, and general tool operation ability, fully covering all educational elements of posts. The platform automatically calculates the importance weight of each competency point based on recruitment frequency, mention frequency in enterprise demands, and universal industry standards, distinguishing core essential competencies, secondary extended competencies, and general basic competencies to clarify teaching priorities. Intelligent analysis establishes precise correlation mapping covering “post–work task–competency requirement–skill point–knowledge point–curriculum.” Two-dimensional or three-dimensional post competency maps visualize competency levels and internal correlations, facilitating teachers, school administrators, and enterprise technical experts to jointly review, revise, and improve curriculum settings and teaching standards in talent training programs ^[6].

3.3. Dynamically optimizing talent training based on data outputs from AI digital platforms to realize synchronous iteration between talent supply and industrial demands, and addressing lagging talent training adjustment mechanisms

Demand perception across the digital platform and data outputs from post competency modeling drive optimization and adjustment of talent training, enabling the supply side of talent to actively adapt to dynamic changes on the industrial demand side. Guided by industrial demand reports generated by the platform, colleges can add majors catering to scarce talents in regional strategic industries and emerging digital technology sectors, discontinue outdated majors with shrinking market demand, surplus talent supply, and disconnection from local industries, and upgrade traditional majors to optimize the overall major layout of the college. Taking post competency maps as the core compilation basis, colleges reposition training objectives for high-end skilled talents, adjust graduation competency attainment requirements, optimize the proportion of theoretical courses and practical teaching hours, and upgrade overall talent training. The

curriculum structure is reconstructed by removing outdated modules irrelevant to post competencies and adding new courses aligned with new quality productive forces such as intelligent manufacturing, digital technology, and green low-carbon industries, promoting the integration of posts, curricula, competitions, certificates, innovation, and research, and iteratively upgrading the curriculum system. Practical training cases and operational projects are designed based on real post work tasks within competency maps to reproduce frontline enterprise production scenarios, improving students' practical post capabilities and entry adaptation speed, and optimizing the practical teaching system ^[5].

3.4. Building a regular evaluation and feedback mechanism linking enterprises, colleges, students, and digital platforms through AI digital platforms to solve the problem of single-dimensional talent training evaluation and guarantee long-term stable matching effects

The AI-enabled system establishes regular evaluation and feedback channels connecting four stakeholders: enterprises, colleges, students, and digital platforms, forming a continuous optimization closed loop to sustain long-term industry-education matching. Enterprises regularly provide feedback on graduates' competency deficiencies at work, updated post skill requirements, and suggestions for teaching improvement, providing frontline industrial evidence for teaching optimization. Colleges monitor the matching degree between curricula and posts, students' attainment of various competencies, and overall major matching degree via the platform backend, and adjust teaching strategies and curriculum contents in a timely manner. Students rely on personalized learning maps to report learning difficulties, post learning demands, and career development directions, driving teaching content to fit students' growth needs. The platform automatically generates multi-dimensional quantitative analysis reports covering major matching degree, post support degree, curriculum matching degree, and graduate employment quality, providing objective data-based decision-making support for colleges in major construction, faculty development, and teaching reform.

4. Practical path of AI-driven industry-education supply-demand matching: A case study of Chaoxing Venus Major Construction System

The Chaoxing Venus Major Construction System is an integrated AI major development platform developed for vocational colleges. Its core components include an intelligent human-post analysis engine and a post competency map conversion hub, supplemented by functional modules for school-based data management, talent training program compilation, major quality evaluation, and school-enterprise research databases, forming a standardized and replicable closed-loop implementation process.

4.1. AI-driven full-scale intelligent research on major demands to lay a solid data foundation for matching

Major directors conduct intelligent industrial demand research using the built-in human-post analysis tool of the platform, which automatically collects online recruitment data and outputs standardized major demand analysis materials. The materials cover national employment scale of the major, regional distribution characteristics, mainstream post clusters, salary ranges, academic and working experience thresholds, industrial development trends, as well as the competitive layout of similar majors in peer colleges and

preliminary ideas for curriculum optimization. Combined with regular field visits to enterprises and exchanges with industry associations, professional teaching teams supplement differentiated skill demands of regional characteristic industries and local micro, small and medium-sized enterprises, ultimately building a talent demand research system integrating national industrial big data and supplementary field research on school-based regional conditions ^[12].

4.2. Collaborative construction of post competency maps by AI algorithms and industry experts

Professional teams define core post groups corresponding to each major based on demand research results. AI algorithms conduct three-dimensional decomposition of competency elements for posts and assign weight values to each competency indicator to form the first draft of post competency maps. After drafting, colleges invite technical experts and human resource managers from leading industrial enterprises, together with academic leaders and frontline teachers, to jointly review and discuss the maps. Competency division precision is further refined for compound segmented posts and emerging digital posts, and mismatches between algorithm-matched curricula, training projects, and vocational certificates are corrected. All competency points are then mapped one-to-one to classroom teaching contents, on-campus training tasks, vocational skill level certificate assessment requirements, and vocational skill competition projects at all levels, ultimately forming standardized post competency maps that conform to current industrial development and the college's school-running resources.

4.3. Iterative revision of talent training programs based on post competency maps

Colleges take post competency maps as the core basis to compile and revise new versions of major talent training programs, breaking the traditional education model where teachers revised programs based solely on teaching experience and previous program templates. During revision, colleges comprehensively optimize talent training systems aligned with regional industrial development and post competency standards. First, major training objectives are precisely adjusted to closely match the core competency demands of mainstream local posts, clarifying the training direction for compound technical and skilled talents that adapt to industrial upgrading. Second, the original curriculum system undergoes systematic optimization: outdated theoretical teaching content disconnected from current post work is eliminated, new teaching modules related to digital and intelligent technologies are added, and the proportion of practical teaching is increased to meet practical post requirements. Third, the graduation assessment and evaluation system for students is innovated, incorporating actual mastery of core post competencies as mandatory graduation assessment indicators to fully implement the comprehensive education concept of integrating posts, curricula, competitions, and certificates. Finally, the practical teaching system is iteratively upgraded. Phased training and enterprise internships are designed hierarchically based on work tasks corresponding to competency maps, fundamentally transforming the college's talent training model from traditional experience-oriented education to a scientific education system supported by data, guided by competency maps and jointly demonstrated by school and enterprise experts ^[13].

4.4. In-depth integration of competency maps into daily teaching to realize integrated development of posts, curricula, competitions, certificates, innovation and research

In daily teaching, teachers integrate post competency maps into the full teaching process covering pre-class preparation, in-class instruction and after-class expansion. Before class, teachers sort out post competency points corresponding to each lesson against the maps and set clear, implementable classroom teaching objectives aligned with actual teaching conditions. During class, targeted practical cases, classroom tasks, and group training projects are designed around defined competency points to closely integrate theoretical learning with post practice. After class, teachers design progressive learning paths for students based on the competency system, clarifying learning priorities, competency attainment standards, and corresponding employment post directions for each stage. Meanwhile, teaching actively connects vocational skill level certificates and industry competition standards to carry out targeted specialized skill training. This teaching model enables students to clearly understand learning content, training priorities, and future matching posts, avoiding passive and blind learning, significantly improving the pertinence of professional study and deepening students' understanding of major-related posts.

4.5. Establishing a long-term mechanism for regular data updating and semester-based map iteration

The platform supports regular data updating: it captures and integrates industrial recruitment information across the internet monthly, dynamically tracking industrial technological innovation, iteration of post skill standards, and changes in employment demands of regional enterprises. To keep pace with industrial development, colleges establish a regular mechanism for iterative updating of teaching content. Every semester, major directors and cooperative industry experts jointly review and revise post competency maps, synchronously updating talent training programs, curriculum standards, and practical teaching contents. Supported by the platform's employment quality monitoring function, colleges continuously collect and analyze graduates' matching employment status, post matching degree, and enterprise employment feedback. Relying on real employment data, post competency maps and classroom teaching contents are dynamically adjusted, gradually forming a closed-loop long-term education mechanism featuring dynamically updated industrial demands, timely optimized post maps, continuously improved teaching systems, and steadily enhanced talent training quality^[14].

4.6. Comprehensive practical effects of platform implementation

Judging from the implementation effects in our university, the Chaoxing Venus Major Construction Platform can specifically address prominent problems in traditional major construction. Previously, manual industrial research was time-consuming and inefficient, with a complete research process taking three to six months. The platform shortens the overall research cycle to one to three working days while greatly expanding research coverage and sample richness. In addition, the platform unifies the judgment basis and evaluation standards for post competencies between schools and enterprises, effectively resolving cognitive deviations and conceptual disagreements in school-enterprise collaborative education and standardizing industry-education cooperation. In terms of major construction, the revision and optimization of talent training programs no longer depend on subjective experience, but are supported by real industrial data, providing scientific evidence for school-running decisions, including major upgrading, new major establishment, and major elimination. In terms of education outcomes, students gain clearer awareness of post competency

requirements and career development paths, with significant improvements in graduate major-matching employment rate, post adaptation speed, and overall salary level. The platform effectively helps colleges continuously improve education quality and service capacity for regional industries.

5. Conclusion

In summary, the core causes of industry-education supply-demand contradictions include information asymmetry between schools and enterprises, inconsistent competency standards between post requirements and talent cultivation, and lagging adjustment mechanisms for college talent training. Taking AI digital platforms represented by the Chaoxing Venus Major Construction System as the carrier, this paper constructs a complete closed loop of “data perception–intelligent analysis–mapping modeling–targeted implementation–dynamic iteration” through four operational mechanisms: full-range intelligent demand perception, intelligent modeling of post competency demands, dynamic optimization of talent training, and four-stakeholder linked evaluation and feedback. The system systematically breaks barriers across the full chain of industries, posts, and talent training, shifting talent training from static supply to dynamic adaptation. It provides a replicable new paradigm for the digital transformation and deep industry-education integration of vocational education.

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Disclosure statement

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