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Research on Practical Teaching for Big Data Majors in the Era of Artificial Intelligence

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Abstract: Against the backdrop of artificial intelligence and digital economy development, practical teaching for big data majors needs to shift its focus from knowledge transmission to competency cultivation. At present, prominent problems including outdated teaching content and insufficient practical training remain prevalent. To address these issues, this paper proposes AI-enabled teaching reforms: constructing an "AI + Knowledge Graph" intelligent teaching system, building intelligent practical training environments, advancing project-driven teaching and the integration of "posts, courses, competitions, certificates and innovation", deepening industry-education integration, and establishing a closed-loop evaluation system. These measures will drive scenario-based and personalized teaching transformation, strengthen students' engineering practice and problem-solving capabilities, and lay solid foundations for the cultivation of application-oriented talents.

Keywords: Artificial intelligence; Big data; Practical teaching; Teaching model

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1. Introduction

Currently, the world is accelerating into an intelligent era where data serves as the core production factor and artificial intelligence acts as the key driving force. Artificial intelligence not only reshapes industrial structures and business models, but also reconstructs the entire education system [1–3]. As an essential foundational discipline supporting artificial intelligence development, the quality of talent cultivation for big data majors directly determines the progress of the digital economy and scientific and technological innovation. In recent years, China has continuously strengthened top-level design in relevant fields. The *Opinions on Strengthening the Discipline Construction of Data Elements and the Development of Digital Talent Teams* emphasizes the deep integration of education chains, talent chains, industrial chains and innovation chains [4]. The *Action Plan for "Artificial Intelligence + Education"* also puts forward requirements to integrate artificial intelligence into all stages of teaching and learning [5]. Against this background, the talent cultivation objective for big data majors has shifted from knowledge delivery to competency development [6], with greater emphasis placed on engineering practical abilities including data collection, processing, analysis, visualization and AI model application [7]. As a vital link connecting theoretical knowledge and industrial demands, the reform and innovation of practical teaching have become a core concern in higher education research [8,9].

2. Major challenges facing practical teaching for big data majors

Despite continuous improvements in the construction of big data majors across universities in recent years, structural shortcomings still exist within practical teaching systems, which undermine the quality of talent cultivation [10,11]. On the one hand, teaching content lags behind technological evolution. Big data and artificial intelligence technologies are advancing toward cloud-native architecture, large model application and intelligent agent development [12–14]. However, many courses and experimental contents remain confined to basic technologies, creating a disconnect between students' knowledge framework and actual industrial requirements. On the other hand, restricted by insufficient funding, computing power and platform infrastructure, most universities cannot support complex data processing and model training tasks, resulting in shallow practical training for students. In addition, existing practical teaching mainly consists of verification-based experiments, lacking comprehensive projects set in real workplace scenarios. The team of dual-qualified teachers and school-enterprise collaborative mechanisms are imperfect, with limited in-depth participation from enterprises, failing to form stable and effective collaborative education mechanisms through industry-education integration [15].

3. Paths and modes of AI-enabled practical teaching reform

The core value of artificial intelligence empowering practical teaching lies not merely in introducing intelligent tools to assist teachers in administrative work, but in reconstructing teaching content, teaching procedures and evaluation systems through data-driven approaches. Traditional practical teaching adopts fixed experimental procedures with unified learning schedules for all students, making it difficult for instructors to identify individual gaps in knowledge comprehension and skill mastery. Supported by artificial intelligence, practical teaching can transform from "unified tasks, unified schedules, unified assessments" to "personalized learning paths, dynamic assignments and process-oriented evaluation".

Specifically, universities can carry out AI-enabled reforms from three dimensions: teaching content, practical training environments and teaching modes. The "AI + Knowledge Graph" framework can integrate course knowledge points, skill requirements and post competencies to realize learning diagnosis and targeted resource recommendation. Intelligent practical training platforms built on cloud computing, big data and AI frameworks can support full-cycle project training. Meanwhile, real enterprise tasks can be incorporated into teaching procedures to deepen the integrated training model of "posts, courses, competitions, certificates and innovation", shifting practical teaching from knowledge-oriented to competency-oriented.

4. Innovative practical mode of in-depth industry-education integration

The core of practical teaching reform lies in deepening industry-education integration and establishing a collaborative education mechanism featuring school-enterprise cooperation, resource sharing, whole-process co-management and joint achievement evaluation. The big data discipline maintains tight connections with industrial practices; classroom teaching alone cannot replicate the complexity of real business scenarios. Therefore, universities should promote school-enterprise cooperation covering courses, projects, tutors and achievement transformation. First, invite enterprise technical specialists to participate in curriculum standard formulation, and translate competency requirements for data analysis, big data development and algorithm positions into modular course contents. Second, introduce desensitized real business data, demand documents and project evaluation criteria, and design basic, comprehensive and innovative tasks tailored to students' varying proficiency levels. Third, establish joint tutoring mechanisms involving both university instructors and enterprise mentors, enabling students to receive dual guidance on theoretical methodologies, engineering specifications and project acceptance standards. Through coherent connections between curriculum projects, discipline competitions, graduation projects and innovation & entrepreneurship training as well as enterprise internships, the outcomes of practical teaching can be continuously refined and transformed, enhancing students' consistent professional growth and post-adaptability.

5. Construction of AI-enabled practical teaching evaluation system

For AI-driven practical teaching reform of big data majors, a comprehensive evaluation system combining process assessment, competency assessment and multi-stakeholder evaluation shall be established. Conventional evaluation methods mostly rely on experimental reports, final projects or written examinations, ignoring students' real performance during practical training. Since practical competencies for big data majors are procedural and comprehensive, evaluation shall focus not only on final deliverables but also on synthesizing learning behavior data, project outputs, and multi-party feedback. Intelligent teaching platforms can collect data including experimental progress, code submissions, debugging records and resource browsing to generate individual learning trajectories, allowing teachers to identify students' weak points and deliver targeted guidance. A complete evaluation indicator system can be constructed covering learning process, knowledge mastery, engineering capabilities, teamwork and professional ethics.

As shown in **Table 1**, this evaluation system balances learning progress, project deliverables and career development potential. Learning process and knowledge mastery indicators are used to measure student participation and identify knowledge gaps; engineering capability indicators assess proficiency in complete project implementation; teamwork and professional ethics indicators evaluate team awareness, sense of responsibility, data security awareness and ethical norms. Joint evaluation by teachers, enterprise mentors, student self-assessment and group peer review can improve the comprehensiveness and authenticity of evaluation results.

Table 1. Design of evaluation indicators for AI-enabled practical teaching

Primary Indicator	Secondary Indicators	Data Sources	Evaluation Focus
Learning Process	Experimental progress, submission frequency, debugging records	Intelligent teaching platform, code repository	Evaluate student participation and learning persistence
Knowledge Mastery	Online tests, completion rate of knowledge points, error distribution	Course platform, knowledge graph system	Identify weak knowledge modules
Engineering Capability	Data processing, model deployment, system construction, project documents	Project outputs, platform logs, defense materials	Evaluate comprehensive full-cycle project capabilities
Collaboration Ability	Task allocation, communication records, team contribution	Team logs, peer evaluation forms	Evaluate teamwork and sense of responsibility
Professional Ethics	Data security awareness, ethical norms, standard compliance	Project reports, enterprise mentor comments	Evaluate post adaptability and social responsibility

6. Conclusion and outlook

Against the backdrop of artificial intelligence, practical teaching for big data majors is undergoing a transformation from knowledge transmission to intelligent, competency-oriented modes. This paper analyzes prominent deficiencies in current practical teaching, including outdated content, insufficient resource support, rigid teaching modes, and superficial industry-education integration, and proposes AI-driven reform approaches. In the future, practical teaching for big data majors will further develop toward intelligence, scenario-based design and lifelong learning. Continuous deep integration of artificial intelligence and education will greatly improve the quality of talent cultivation and foster high-quality application-oriented professionals capable of supporting digital economic development.

Disclosure statement

The authors declare no conflict of interest.

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