Education Reform and Development, 2026, Volume 8, Issue 3
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Research on the "Three-Training and Three-Stage" Project-Based Teaching Model for Higher Vocational Big Data Major Based on AI Technology

Fangfang Li, Baohua Tian

Shandong Labor Vocational and Technical College, Jinan 250300, Shandong, China

Copyright: © 2026 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: With the continuous penetration of artificial intelligence (AI) in various fields, a large number of new work scenarios have emerged. The growing demand for data in various industries means that society needs more professional talents proficient in big data technology to meet new challenges and opportunities, making this major one of the most popular majors. To improve the quality of talent training in the big data major, many colleges and universities have actively introduced enterprises into campuses, carried out cooperation, and promoted teaching reforms. However, there are still problems such as superficial school-enterprise cooperation and insufficient scenario adaptability. Based on this, this paper discusses the existing problems in the teaching of the higher vocational big data major, proposes the construction of a three-dimensional teaching space of "digital classroom - virtual classroom - enterprise classroom", and explores and designs the "three-training and three-stage" project-based teaching model. It aims to improve students' professional skills and vocational literacy, and provide a promotable paradigm for the teaching reform of the higher vocational big data major.

Keywords: AI technology; Higher vocational big data major; Three-training and three-stage; Project-based teaching; Classroom revolution

Online publication: April 10, 2026

1. Introduction

The "Implementation Plan for the Integration of Production and Education Empowerment and Enhancement Action in Vocational Education (2023-2025)" clearly proposes to promote the in-depth integration of new technologies, such as artificial intelligence, with vocational education and build a sound interaction ecology between production and education. As the core driving force of the digital economy, the demand for technical and skilled talents in related industries has shown explosive growth, requiring practitioners to not only have a solid theoretical foundation but also possess strong practical abilities, problem-solving abilities, and innovative application abilities. This paper adopts the "three-training and three-stage" project-based teaching model, promotes the high-quality development of education and teaching in the higher vocational big data major by reconstructing teaching space, innovating teaching processes, and optimizing evaluation systems.

2. Connotation and theoretical basis of the "three-training and three-stage" project-based teaching model

2.1. Core connotation

The core of the "three-training and three-stage" project-based teaching model is to give play to the advantages of AI technology, take real projects as carriers, and follow the logic of promoting students' growth in a progressive manner to build a new "space-content-ability" trinity teaching ecolog^{y} [1]. The entire model aims at the development of students' vocational abilities, creates digital classrooms, virtual classrooms, and enterprise classrooms to expand the teaching field, and connects teaching content with scenario training, case training, and real project training. It enables students to consolidate the foundation of theoretical and practical skills, then master core abilities, and finally develop comprehensive abilities, making the entire learning process more in line with industrial reality and students' cognitive laws.

The "three classrooms" refer to "digital classroom", "virtual classroom", and "enterprise classroom", whose core is to expand the teaching space and break the physical boundaries of traditional classrooms. The "digital classroom" is built relying on AI agents and digital twin technology, which intelligently pushes learning resources or simulates job scenarios for situational training according to students' learning trajectories [2]; the "virtual classroom" relies on provincial on-site engineer projects, allowing students to participate in case-based training through remote collaboration and gain access to front-line enterprise technical standards and project experience; the "enterprise classroom" integrates real enterprise production scenarios and project tasks directly into teaching through school-enterprise cooperation of introducing enterprises into campuses, providing students with an immersive practical environment.

The "three trainings" carry out hierarchical reconstruction around teaching content, making skill training more hierarchical. Scenario training mainly helps students convert book knowledge into practical basic skills by building basic scenarios close to jobs; case training focuses on strengthening and improving core skills, selecting typical real cases from the industrial front line for modular decomposition, and guiding students to deepen their understanding and application of core technologies in the process of analyzing and solving problems [3]; real project training focuses on the comprehensive development of comprehensive abilities, allowing students to directly participate in actual enterprise projects and improve their skills in practice.

The "three stages" follow the growth law of students' vocational abilities and form a progressive training path. First, focus on consolidating students' theoretical foundation and basic operational skills; then, focus on the development of single post projects, enabling students to proficiently master the core technologies and methods of the big data major and have the ability to independently handle special tasks [4]; the comprehensive ability stage is oriented to the practical combat of post (group) linkage projects, encouraging students to integrate learned skills and improve their comprehensive literacy in cross-post collaboration, complex problem-solving, and innovative application.

2.2. Theoretical basis

(1) Constructivist Learning Theory: Emphasizes that learning is a process in which learners actively explore and collaboratively interact to construct knowledge in real scenarios. In the "three-training and three-

stage" teaching model, students can complete tasks such as data modeling and project development in groups through case training in virtual classrooms and real project training in enterprise classrooms, and construct a professional knowledge system in the process of continuously independently analyzing problems and collaboratively solving them.

(2) Competency-Based Education Theory: Takes vocational post abilities as the core and focuses on the cultivation of students' skills. Teaching is oriented to the ability requirements of big data posts, decomposes the skills required by posts into progressive project training, and strengthens talent training according to post needs.

(3) Technology-Integrated Education Theory: Advocates the use of modern information technology to optimize the teaching process and improve teaching effects. The application of AI technology and digital twin technology can reconstruct teaching space and teaching methods, realizing the intelligence of teaching resources, the realism of teaching scenarios, and the personalization of teaching processes.

3. Practical construction of the "three-training and three-stage" project-based teaching model

3.1. Build "three classrooms" and reshape teaching space

3.1.1. Construct a "digital classroom" and empower situational training with AI agents

Relying on AI agents and digital twin technology, teachers can build a "digital classroom" integrating resource push, scenario simulation, and real-time feedback [5]. AI agents can analyze students' learning behavior data and push personalized learning resources. Digital twin technology establishes a virtual training environment identical to real jobs, designing immersive scenario projects for students.

Compared with traditional theoretical lecture-based classrooms, digital classrooms have more advantages. In most traditional classroom teaching, teachers lecture on theoretical knowledge to students. Even if students have a solid theoretical foundation, they may be at a loss when facing work scenarios. The advantage of digital classrooms is that they allow students to understand and apply knowledge in real situational training and gain experience in practice [6]. For example, teachers can design scenario projects related to digital retail and smart people's livelihood according to content such as data collection and data cleaning. Let students experience work processes immersively, master professional basic skills such as Python programming and SQL query in completing specific work tasks, and possess basic skills for big data posts. AI agents can also be used to real-time monitor students' operation processes, promptly correct mistakes for students, and provide personalized guidance to help students quickly master basic skills [7].

3.1.2. Build a "virtual classroom" and carry out remote collaborative training

Relying on provincial on-site engineer projects, build a remote training virtual platform and access real enterprise project environments. This classroom model can break the limitations of time and space, introduce real enterprise production scenarios and technical expert resources into the teaching process, and carry out remote collaborative training [8].

In specific teaching practice, a virtual classroom is built relying on the "AI Laozhi Companion Learning System". Teachers select real enterprise case projects for modular decomposition, design them into single case projects, and grade them by difficulty (basic level, advanced level, challenge level) [9]. Students remotely access the enterprise training platform and carry out training such as case analysis, model construction, and algorithm optimization under the guidance of the AI Laozhi Companion Learning System. At the same time, the system also serves as a virtual tutor, which can answer students' questions in real time and provide thinking guidance with the support of technologies such as natural language processing and knowledge graphs. With the help of the platform, students can also carry out cross-regional cooperation with enterprise engineers to complete training tasks.

Taking "customer portrait modeling" teaching as an example, students access real user datasets of an e-commerce enterprise through the virtual classroom, complete the development of single projects such as data annotation, feature engineering, and model training under the guidance of AI virtual tutors. Enterprise engineers review project results online and put forward optimization suggestions, so that students can experience real on-the-job scenarios at school, improve their skills in real training, and accumulate project experience.

3.1.3. Create an "enterprise classroom" and carry out real project training through the integration of production and education

With the help of the "introducing enterprises into campuses" project, we can co-build a "digital factory" with Huawei ICT Academy and local big data enterprises, introducing real enterprise projects, production processes, and management standards into teaching. The enterprise classroom needs to set up two functional areas: one is the project practical training area, where servers and data collection equipment donated by enterprises are placed, and students participate in real projects as enterprise apprentices.

The second is the AI monitoring area, which collects project progress data through the industrial Internet of Things. The AI system real-time analyzes team collaboration efficiency and task completion quality, and generates project optimization plans.

For example, in the teaching of "big data comprehensive projects", students are divided into groups to participate in the real project of "credit risk assessment" of a bank. They complete practical training under the guidance of enterprise mentors and AI systems. After the project results are reviewed and optimized by enterprise mentors, they are delivered to the enterprise for use.

4. Design of the "three-training and three-stage" project-based teaching model empowered by ai

Taking the advancement of post abilities as the main line, AI technology is integrated into training content, training processes, and training evaluation to build the "three-training and three-stage" project-based teaching model, gradually cultivating students' basic abilities, core abilities, and comprehensive abilities.

4.1. Stage 1: Scenario project training — practice of basic post tasks

4.1.1. Training objectives

This stage corresponds to digital classroom teaching, focusing on cultivating students' mastery of basic big data post skills (such as data collection, SQL query, data preprocessing, etc.), understanding of basic industry norms, and enabling students to move from novices to industry beginners [10].

4.1.2. AI empowerment paths

First, reconstruct teaching content. During teaching implementation, the AI agent reconstructs teaching content, decomposing theoretical courses such as "Introduction to Big Data and Python Programming Basics" into different scenario projects, such as campus consumption data analysis and student performance statistics. Each project includes three parts: "task description, data resources, operation guidelines".

Second, carry out real-time monitoring. When students complete scenario projects on the digital twin platform, the AI system real-time monitors operational behaviors. For example, if a student makes multiple operational mistakes, it automatically matches similar scenario cases for reference [11].

Third, conduct evaluation and feedback. The AI system can generate process evaluation reports based on three-dimensional indicators: task completion, operational standardization, and knowledge mastery. Teachers conduct targeted counseling based on the reports.

4.2. Stage 2: Case project training — development of single post projects

4.2.1. Training objectives

This stage corresponds to the virtual classroom, aiming to enable students to master core big data post skills (such as data modeling, machine learning algorithm application, and model evaluation), have the ability to independently complete single projects, and transition from beginners to proficient practitioners.

4.2.2. AI empowerment paths

First, match cases. Based on the evaluation results of students in the first stage, the AI Laozhi Companion Learning System pushes industry cases matching their ability levels. For example, it pushes basic cases of "customer churn prediction" for students with weak data modeling abilities, and advanced cases of "precision marketing recommendation" for students proficient in algorithm application.

Second, assist in collaborative training. Students form cross-school collaborative groups in the virtual classroom. The AI system automatically groups students according to their learning situation and assigns case project roles, such as data engineers, algorithm engineers, and visualization engineers [12].

Third, conduct an intelligent evaluation. The AI system adopts a multi-dimensional evaluation system of "model performance indicators (accuracy rate, recall rate) + project document standardization + team collaboration efficiency" to automatically evaluate case project results and generate optimization suggestions.

4.3. Stage 3: Real project training — practical combat of post (group) linkage projects

4.3.1. Training objectives

This stage corresponds to the enterprise classroom, requiring students to master comprehensive skills such as project demand analysis and cross-post collaboration for big data posts, have the ability to participate in real enterprise projects, and transform from proficient practitioners to post experts [13].

4.3.2. AI empowerment paths

First, decompose projects. The AI system decomposes real enterprise projects into subtasks such as data collection, data storage, data analysis, and visualization deployment, clarifying the responsibilities and collaboration processes of each post.

Second, conduct dynamic monitoring. In project practical training, the AI system collects data such as task progress and code submission frequency through the industrial Internet of Things, and can issue early warnings, allocate resources, or adjust task assignments according to the actual situation [14].

Third, promote achievement transformation. AI assists students in transforming project results into technical reports, patents, or competition works. For example, in the "agricultural big data analysis" project, the AI system guides students to sort out data modeling methods, form utility model patent application documents, and promote the industrialization transformation of teaching achievements [15].

5. Conclusion

The "three-training and three-stage" project-based teaching model for the higher vocational big data major based on AI technology expands the teaching space by building "three classrooms", reconstructs the teaching process with "three-training and three-stage", and integrates AI technology into the entire teaching process. It can connect the teaching process with industrial reality, cultivate talents who can quickly adapt to post needs, promote the integration of school-enterprise resources, and effectively solve various problems faced by traditional teaching models. In the future, educators need to deepen reforms in practice, continuously explore new paths and methods for the integration of AI technology and teaching, optimize the "three-training and three-stage" teaching model, and cultivate more high-quality technical and skilled talents who meet the development needs of the digital economy.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Han XY, 2024, Vocational Education Practice of Future Classroom Teaching Forms. Educational Communication and Technology, (S1): 3–8 + 14.

[2] Zhu CH, Yuan DF, 2024, Exploration on the Teaching Reform Path of Higher Vocational Big Data Technology Major — Against the Background of Artificial Intelligence Development. Leadership Science Forum, (12): 130–132.

[3] Wu J, 2024, Talent Training Path for On-Site Engineers in Big Data Technology Professional Group. Knowledge Window (Teacher Edition), (11): 43–45.

[4] Sun YN, 2024, Research on the Construction of Curriculum System for Higher Vocational Big Data and Accounting Major from the Perspective of Integration of Production and Education. Accountant, (19): 99–101.

[5] Sun XQ, Tao Y, Jin XB, 2024, Exploration on Project-Driven Teaching Practice of Big Data Major. TV University Science & Technology, (03): 32–36.

[6] Dou Q, 2024, Exploration on the Upgrade of Curriculum System for Higher Vocational Big Data Technology and Application Major. Journal of Hubei Open Vocational College, 37(16): 162–164.

[7] Gao P, 2024, Exploration and Practice of Training Paths for On-Site Engineers in Vocational Education Under the Digital Intelligence Background. Public Relations World, (18): 39–41.

[8] Zhai M, 2024, Research on the Training Model of On-Site Engineers for Applied Chemical Technology Major Under the Digital Intelligence Background. Modern Vocational Education, (22): 145–148.

[9] Yang TY, Zhang Y, 2024, Research on the Innovation of Talent Training for "Big Data +" Financial Management Major Empowered by Artificial Intelligence Technology. Modern Business Research, (14): 131–133.

[10] Chen C, Guo LJ, Liu XL, 2024, Preliminary Exploration on the Application of Digital Twin Technology in Smart Learning Spaces. Digital Technology and Application, 42(03): 143–145.

[11] Ding ZP, Lai YX, Chen JB, 2024, Exploration on the Practical Teaching of Industry-Education Collaborative Talent Training for Higher Vocational Big Data Technology Major. China CIO News, (02): 169–172.

[12] Peng XC, Yang XY, Yan Z, et al., 2023, Design and Application of Virtual Simulation Teaching Supported by "AI Intelligence + VR Technology". Digital Technology and Application, 41(05): 89–91.

[13] Zhou L, Zhao Y, Liu Y, et al., 2022, Construction and Practice of the "Three Classrooms" Education Model in Undergraduate Vocational Education. The Science Education Article Collects, (23): 119–124.

[14] Wang XG, Zhou Q, 2021, Twin Venues: A Virtual-Real Symbiotic Learning Space Integrating Digital Twins. Modern Educational Technology, 31(07): 5–11.

[15] Chen LL, 2020, Construction and Application of Big Data Training Platform in College Professional Teaching. Computer Knowledge and Technology, 16(28): 108–110 + 126.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.