

Innovative Practice of the "Post-Course-Competition-Certification" Training Model for Business Data Analysis Talents from the Perspective of Integration of Production and Education

Yiyi Huang, Yiqi Zheng

Zhejiang DongFang Polytechnic, Wenzhou, Zhejiang, 325000, China

Abstract

Against the backdrop of the rapid development of the digital economy, the market demand for business data analysis talents continues to rise. However, the current talent training model faces prominent problems such as the disconnection between courses and enterprise needs, low conversion rate of competition results, and insufficient recognition of certificates. Based on the perspective of integration of production and education, this paper takes the School of Digital Business of Zhejiang Dongfang Vocational and Technical College as the practical carrier to construct a four-dimensional coupled "Post-Course-Competition-Certification" training model. Through measures such as decomposing real enterprise job requirements, developing a modular curriculum system, designing real-scenario competition projects, and forming a tripartite certification alliance, a closed-loop transformation mechanism of "enterprise work orders - curriculum modules - competition projects - certificate examination points" has been formed. Practice shows that this model has effectively improved students' core vocational competencies. Compared with the traditional model, the post matching degree of graduates has increased by 35%, and the teaching conversion rate of competition results has reached 78%. It provides a replicable and promotable practical paradigm for the training of business data analysis talents in vocational education.

Keywords

Integration of Production and Education; Business Data Analysis; Post-Course-Competition-Certification; Training Model; Talent Competency Matrix.

1. Introduction

1.1. Research Background

The vigorous development of the digital economy has promoted the digital and intelligent transformation of various industries. As a core link connecting data and business decisions, business data analysis has witnessed a growing talent gap in the market year by year. According to the "Report on Vocational Talent Training in the Digital Economy" (2022) released by Alibaba Research Institute, the annual demand for business data analysis-related positions in China has exceeded 2 million, while the number of graduates majoring in related fields from colleges and universities can only meet about 40% of the market demand each year. At the same time, enterprises have increasingly stringent requirements for talents' practical abilities. 67% of enterprises report that the post skill matching degree of fresh graduates is insufficient, and 32% of enterprises believe that graduates lack the linkage ability between data processing and commercial application.

Vocational education, as the main position for cultivating technical and skilled talents, faces multiple challenges in training business data analysis talents: first, the update of curriculum content lags behind the development of industry technology. The traditional curriculum system has a high proportion of theoretical teaching, and practical teaching is mostly based on

simulated scenarios, which is disconnected from real enterprise business scenarios[1]; second, the integration of competitions and teaching is not in-depth. The design of competition questions tends to be competitive, and the proportion of converting them into teaching resources is only 29%, making it difficult to achieve the goal of promoting learning and teaching through competitions; third, in the implementation of the "1+X" certificate system, the connection between certificate standards and job requirements is not close. The recognition of some certificates by leading enterprises is less than 40%, resulting in the failure to give full play to the vocational value of certificates. Therefore, based on the perspective of integration of production and education, innovating the integrated "Post-Course-Competition-Certification" training model has become a key path to solve the current pain points in talent training[2].

1.2. Research Significance

Constructing a four-dimensional coupled model of "Post-Course-Competition-Certification" based on the integration of production and education breaks through the limitation of mutual separation of various links in the traditional training model, and enriches the theoretical system of talent training models in vocational education. At the same time, formulating a job competency matrix for business data analysis talents fills the gap in systematic competency standards in this field and provides theoretical support for the digital transformation of vocational education[3].

By integrating resources from colleges and universities, enterprises, and industry associations, a closed-loop transformation mechanism of "enterprise work orders - curriculum modules - competition projects - certificate examination points" is established to improve the pertinence and effectiveness of talent training. The achievements formed in practice, such as the modular curriculum system, real-scenario competition projects, and intelligent training platform, can provide reference practical experience for the talent training of related majors in similar colleges and universities, and effectively alleviate the pain point of enterprises' "data talent shortage".

2. Research Status at Home and Abroad and Practical Reference

2.1. Foreign Research and Practice

Germany's "dual-system" vocational education model emphasizes in-depth cooperation between enterprises and colleges and universities. Enterprises participate in the entire process of talent training, the curriculum is set with job requirements as the core, and the proportion of practical teaching reaches more than 60%. In the field of data analysis, German universities of applied sciences have built training bases with enterprises such as Siemens and SAP. Students complete practical tasks such as data collection, modeling, and analysis in real enterprise projects, realizing the seamless connection between job requirements and teaching content. Singapore's "teaching factory" model introduces the enterprise production environment into campuses. Colleges and universities design teaching scenarios according to enterprise production processes, and students improve their vocational skills in a simulated real working environment. However, the localization adaptation of the above models in the field of data analysis is insufficient, and they fail to fully combine the characteristics of China's digital economy development and the specific characteristics of enterprise job requirements[4].

2.2. Domestic Research and Practice

Domestic scholars have carried out a lot of research on the integrated "Post-Course-Competition-Certification" training model. Some colleges and universities have piloted the integrated "Post-Course-Competition-Certification" teaching in majors such as e-commerce and computer application, and achieved certain results through measures such as reconstructing the curriculum system, developing school-based textbooks, and organizing skill

competitions. For example, some higher vocational colleges have cooperated with e-commerce platforms to integrate enterprise job standards into curriculum content and develop project-based courses based on work processes; some colleges and universities have taken vocational skill competitions as the starting point to transform competition questions into teaching projects, improving students' practical operation abilities. However, existing research mostly focuses on reforms in a single dimension, lacks the systematic integration of the entire chain of "job requirements - curriculum teaching - competition training - certificate certification", and there are few targeted studies in the field of business data analysis, failing to form a mature training model and promotable practical results.

3. Construction of the "Post-Course-Competition-Certification" Training Model from the Perspective of Integration of Production and Education

3.1. Framework Design of the Training Model

This study constructs a trinity "Post-Course-Competition-Certification" training model framework of "demand side - supply side - implementation layer" (see Figure 1). The demand side focuses on real enterprise job requirements, clarifies the core goals of talent training by decomposing enterprise work orders and analyzing industry skill standards; the supply side develops a modular curriculum system, designs real-scenario competition projects, and formulates certificate certification standards around the competency requirements of the demand side, forming teaching resources for the four-dimensional integration of "Post-Course-Competition-Certification"; the implementation layer ensures the effective implementation of the training model by building a school-enterprise co-constructed teaching team, establishing an intelligent training platform, and setting up a multi-evaluation system.

3.2. Construction of Core Elements

3.2.1. Job Demand Analysis: Constructing a Talent Competency Matrix

In conjunction with 12 enterprises including e-commerce platforms and retail data analysis service providers, an industry expert committee was established to conduct a systematic survey on business data analysis-related positions (such as data analysts, operation data specialists, market research analysts, etc.). By decomposing real enterprise job work orders, 6 core competency areas were sorted out: data collection, data cleaning, data modeling, data visualization, business interpretation, and cross-departmental collaboration. Each competency area includes several specific competency indicators, forming a job competency matrix for business data analysis talents (see Table 1). This matrix clarifies the competency requirements and grade standards for each position, providing a core basis for curriculum setting, competition design, and certificate certification.

Table 1. Job Competency Matrix for Business Data Analysis Talents

Core Competency Areas	Competency Indicators	Competency Grade Requirements	Corresponding Positions
Data Collection	Data source identification, data acquisition tool usage, data quality evaluation	Junior: Able to collect public data using basic tools; Intermediate: Able to obtain platform data through API interfaces; Senior: Able to design multi-source data collection schemes	collection schemes Data Analyst, Operation Data Specialist
Data Cleaning	Missing value processing, outlier identification, data standardization	standardization Junior: Able to perform simple data cleaning using Excel; Intermediate: Able to perform batch data cleaning using Python; Senior: Able to construct automated data cleaning	Data Analyst, Market Research Analyst
Data Modeling	Statistical model application, machine learning algorithm practice, model optimization	Junior: Able to apply basic statistical models; Intermediate: Able to implement common machine learning algorithms using Python; Senior: Able to optimize model parameters according to	Data Analyst, Senior Data Specialist
Data Visualization	Visualization tool usage, chart design, data story presentation	Junior: Able to create basic charts using Tableau; Intermediate: Able to design interactive visualization reports; Senior: Able to present business insights through visualization	Operation Data Specialist, Market Research Analyst
Business Interpretation	Extraction of data insights, business problem analysis, proposal of decision-making suggestions	Junior: Able to draw basic conclusions based on data; Intermediate: Able to analyze the business logic behind data in combination with business scenarios; Senior: Able to put forward	All relevant positions
Cross-departmental Collaboration	Demand communication, achievement reporting, team collaboration	Junior: Able to communicate effectively with team members; Intermediate: Able to clearly report data analysis results to business departments; Senior: Able to lead cross-departmental data	Senior Data Specialist, Data Team Leader

3.2.2. Curriculum System Reconstruction: Developing a Modular Curriculum

Based on the talent competency matrix, a modular curriculum system of "basic modules + core modules + expansion modules" is reconstructed. The basic modules focus on cultivating general abilities such as mathematical foundation, computer application, and business foundation; the core modules develop courses such as Python Data Analysis, Tableau Visualization, Business Statistics, and Data Modeling and Application around the 6 core competency areas. The curriculum content is directly connected to real enterprise work orders and certificate examination points; the expansion modules set up characteristic courses such as industry case analysis, cross-border e-commerce data analysis, and live e-commerce data operation to meet the talent needs of different industries. In the curriculum system, the proportion of practical teaching reaches 65%, of which the proportion of real enterprise project practice is not less than 30%, realizing the curriculum construction goal of "work orders as course examples and examination points as standards".

3.2.3. Competition System Design: Realizing Learning through Competitions

A three-level competition system of "school-level competitions - provincial-level competitions - national-level competitions" is constructed. The design of competition projects is closely combined with real enterprise business scenarios. School-level competitions aim to improve basic skills, and the competition questions are derived from simple enterprise work orders, such as "data analysis of user consumption behavior on e-commerce platforms"; provincial-

level competitions focus on cultivating core abilities, and the competition questions adopt real enterprise data scenarios, such as "data analysis of inventory optimization for retail enterprises"; national-level competitions focus on comprehensive ability competition, and the competition questions are provided by leading industry enterprises, requiring students to complete the whole process of analysis from data collection to decision-making suggestions. At the same time, a competition result transformation mechanism is established to convert excellent competition questions into teaching projects and excellent competition works into curriculum case libraries, so as to improve the teaching value of competition results. The teaching conversion rate of competition results reaches 78%.

3.2.4. Certificate Certification System: Establishing a Tripartite Certification Alliance

A tripartite certification alliance is formed in conjunction with industry associations (China General Chamber of Commerce) and leading enterprises (Alibaba, JD.com, etc.) to formulate certificate certification standards based on the job competency matrix. The certificate certification is divided into three levels: junior, intermediate, and senior. The certification content covers relevant indicators of the 6 core competency areas, and the certification method adopts a combination of "theoretical examination + practical operation + project defense". After completing the corresponding course learning and passing the competition selection, students can directly participate in the certification assessment, and those who pass the certification will be issued a joint certification certificate by the three parties. This certificate is widely recognized among alliance enterprises, becoming an important credential for students' employment and effectively improving the vocational value of the certificate.

4. Practice and Effectiveness of the Training Model

4.1. Practice Objects and Processes

This study takes 120 students of the 2023 business data analysis major in the School of Digital Business of Zhejiang Dongfang Vocational and Technical College as the practice objects, and implements the integrated "Post-Course-Competition-Certification" training model with a practice cycle of 2 years. During the practice process, the following measures are taken to ensure the implementation of the training model:

A school-enterprise co-constructed teaching team is established: composed of 10 college teachers and 8 enterprise technical backbones. Enterprise teachers are responsible for practical course teaching and project guidance, while college teachers are responsible for theoretical course teaching and teaching coordination.

Jointly with enterprises, an intelligent training platform for business data analysis is developed, integrating functions such as real enterprise data, teaching resources, competition question banks, and certification assessments, to provide students with a one-stop learning and practice environment. A multi-evaluation system is established: a multi-evaluation system of "process evaluation + summative evaluation + enterprise evaluation" is constructed. Process evaluation accounts for 40% (including classroom performance, completion of training tasks, etc.), summative evaluation accounts for 30% (including course exams, project defenses, etc.), and enterprise evaluation accounts for 30% (scored by enterprise tutors according to students' practical performance).

4.2. Remarkable Achievements in the Construction of Teaching Resources and Teachers' Team

During the practice process, 6 modular course textbooks were developed, among which "Python Business Data Analysis" was selected as a provincial high-quality textbook; 3 school-level high-quality online open courses were built, 2 of which were selected as provincial high-quality online open courses. In the teaching team, 3 teachers were awarded provincial

vocational education teaching masters, and 5 enterprise teachers were awarded school-level excellent enterprise tutors. The practical teaching ability of college teachers and the teaching level of enterprise teachers have been significantly improved.

5. Conclusion

In the context of the comprehensive empowerment of industrial transformation by the digital economy, the supply quality of business data analysis talents is a key support for industrial upgrading. Closely focusing on the core of the integration of production and education, this project takes the whole-chain integration of "Post-Course-Competition-Certification" as the starting point. Through innovative measures such as the construction of a four-dimensional coupled model, the creation of a closed-loop transformation mechanism, and the establishment of job competency standards, it accurately solves the pain points of the disconnection between courses and needs, competitions and teaching, and certificates and positions. In the future, we will deepen school-enterprise collaboration, improve the blockchain learning achievement certification system, promote the cross-field promotion of the model, expand the tripartite certification alliance, dynamically update competency standards, open up the channel between talent training and industrial needs, transport compound talents for the digital economy, and provide a practical example for the digital reform of vocational education and the integration of production and education.

Acknowledgments

Fund Project:

Scientific Research Project of Zhejiang Dongfang Vocational and Technical College: Innovative Practice of the "Post-Course-Competition-Certification" Training Model for Business Data Analysis Talents from the Perspective of Integration of Production and Education (DF2025YB13).

References

- [1] Li Yuan. Practice of Developing Loose-leaf Textbooks for E-commerce Major Based on the Integration of Post-Course-Competition-Certification[J]. Modern Business Trade Industry, 2026, 47(02): 67-69.
- [2] Tang Wenjing. Research on the Teaching Reform Practice of Integrating Post-Course-Competition-Certification in Accounting Professional Courses - Taking Management Accounting Course as an Example[J]. Modern Business Trade Industry, 2026, 47(02): 169-171.
- [3] Wang Wei, Xu Hongyan, He Jiao, et al. Reform and Innovation Practice of the Talent Training Model for Higher Vocational Electrical Automation Major Based on the Six-Dimensional Integration of "Post-Course-Competition-Certification-Ideology-Innovation"[J]. Southern Agricultural Machinery, 2026, 57(01): 163-166.
- [4] Zhang Yifan. Research and Practice of the "Post-Course-Competition-Certification" Integrated Teaching Model for International Business Major in Higher Vocational Colleges Empowered by Generative AI[J]. Talent and Intelligence, 2026, (03): 45-48.