Practical Application of Python Technology in Intelligent Finance Courses for Vocational Undergraduate Education under Industry-Education Integration

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Abstract: *With industrial upgrading and the deepening development of the digital economy, the financial sector is undergoing a profound transformation from computerization to intelligentization, and from accounting-oriented to decision-support driven. As an efficient, flexible programming language with a strong ecosystem, Python has become a key technical tool in the era of intelligent finance. Against this backdrop, vocational undergraduate education—as the primary platform for cultivating high-level technical talents—must inevitably integrate Python technology into its intelligent finance courses, marking an imperative trend. However, the current teaching practice generally faces practical predicaments such as the disconnection between curriculum content and industry application, weak practical teaching components, and insufficient competencies of the faculty team. This study delves deeply into the main application scenarios of Python technology in intelligent finance, systematically analyzes the key challenges faced by vocational undergraduate education in conducting related teaching, and builds a practice teaching pathway centered on "curriculum content reconstruction, practice system rebuilding, co-construction of faculty team, and reform of assessment methods" from the perspective of industry-education integration. This paper emphasizes that by deepening school-enterprise cooperation and integrating real enterprise projects, data and cases into the whole teaching process, it is possible to effectively bridge the gap between theory and practice, and cultivate interdisciplinary and application-oriented financial talents capable of proficiently utilizing Python technology to solve modern financial problems.*

Keywords: *Industry-Education Integration; Python Technology; Vocational Undergraduate Education; Intelligent Finance; Curriculum Practice*

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1.Introduction

We are in an era of data-driven decision-making. As the core of enterprise management, the financial sector is rapidly reconfiguring its functional boundaries and technology intension. The traditional manual-operated post-event accounting-centered financial work pattern can no longer meet the urgent needs of enterprises for real-time analysis of financial data, accurate risk early warning and strategic foresight support. Digital technologies, such as big data, artificial intelligence and cloud computing, are promoting "intelligent finance" from a concept to the reality with unprecedented power. In this process, Python, with its concise syntax, powerful data processing and analysis libraries, such as Pandas and NumPy, and outstanding performance in Machine Learning and Web Crawler, has naturally become a key technical lever for achieving financial intelligence. Vocational undergraduate education aims to cultivate high-quality technical talents for the front lines of production, management and service. Its intelligent finance course setting must respond sensitively to this industrial technological change. However, it is an extremely challenging task to seamlessly integrate Python, a robust engineering-centric technology, into finance courses with a strong business background and ensure that students can apply what they have learned. It is difficult for the conventional teaching model, which is divorced from industrial practice, to be competent for the job. Therefore, under the macro framework of industry-education integration, it is necessary to systematically study the implementation pathways for Python technology in intelligent finance courses. This is not only a key breakthrough

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for improving the quality of financial talent cultivation in vocational undergraduate education, but also a strategic necessity for promoting financial education to adapt to the development of the digital economy.

2.Main Application Scenarios of Python Technology in Intelligent Finance

To effectively integrate Python into the curriculum, it is first necessary to accurately grasp its value and application fields in modern financial work. This constitutes the fundamental basis for the design of curriculum content.

2.1 *Automated Acquisition and Cleaning of Financial Data*

Traditional financial analysis often starts with internal structural data that has been initially organized, while the analytical range of intelligent finance expands to broader internal and external data sources. Python demonstrates a huge advantage here. Through web crawlers, such as Requests and BeautifulSoup, enterprises can capture automatically unstructured or semi-structured data like macroeconomic data, financial information of their competitors, and market sentiment from channels such as financial websites, annual report disclosure platforms of listed companies, and industry databases. Subsequently, they can use libraries like Pandas to efficiently clean, transform, integrate and reduce the acquired raw data and potentially messy internal financial data within the enterprises. This process liberates financial personnel from the cumbersome and repetitive work of data collection and organization, laying high-quality data foundation for their in-depth analysis [1].

2.2 *Financial Data Analysis and Visualization*

This is the most extensive and central scenarios where Python is applied in financial sector. With the help of Pandas and NumPy, students can easily achieve multi-dimensional and large-scale financial data analysis that far outperforms the processing capacity of Excel. For instance, it can automatically perform financial ratio calculation, trend analyses, and comparative analysis of the budget and actual situation, etc. By integrating visual libraries, such as Matplotlib, Seaborn, and Plotly, complex financial data can be transformed into intuitive charts, such as dynamic trend lines, cost structure waterfall plots, and profitability radar maps, which make the presentation of financial information more insightful and expressive, and greatly enhance the efficiency and effectiveness of financial reports and decision support [2].

2.3 *Financial Risk Forecast and Machine Learning Model Construction*

This is a high-level manifestation of the “intelligence” of intelligent finance. Machine learning libraries, such as Scikit-learn and TensorFlow, of Python make it possible to integrate predictive analytics into finance courses. Students can learn to build customer credit risk scoring models by using historical financial data of enterprises such as the accounts receivable aging and past credit records, predict sales revenue or cash flow by using time series analysis models such as ARIMA and LSTM, and even utilize algorithms to identify and warn of potential financial fraud. This application has shifted the focus of financial work shift from post-event reporting to real-time monitoring and predictive forecasting, greatly enhancing the value of financial management [3].

2.4 *Intelligent Financial Robots and Process Automation*

Although professional RPA tools are convenient, Python can be equally capable of performing numerous desktop automation tasks by virtue of its libraries, such as PyAutoGUI and Selenium. In teaching, students can be guided to write scripts to simulate financial process tasks with clear rules and high repetition, such as automatically logging into the bank system to download statements, automatically verifying and entering invoices, and automatically sending reminder emails. This not only enables students to understand the working principle of RPA (Robotic Process Automation), but also cultivates their awareness of optimizing working processes through programming thinking [4].

3.The Main Challenges Faced by Vocational Undergraduate Education to Integrate Python Technology into Its Intelligent Finance Courses

Despite its broad application prospects, the comprehensive integration and effective teaching of Python technology in vocational undergraduate education still face a series of urgent practical challenges.

3.1 *Students Have Both a Weak Foundation and a Fear of Difficulty*

In vocational undergraduate education, the vast majority of students majoring in finance have a background of liberal arts and have hardly been exposed to programming before. Accustomed to rote memorization and comprehension-based learning models, they commonly experience cognitive dissonance toward the logical thinking, abstract reasoning, and debugging capabilities required for programming, often developing resistance and anxiety. It is the first hurdle in achieving learning objectives how to design a learning path that starts from scratch, progresses step by step and is guided by interests.

3.2 *The Curriculum Content Is Disconnected from Industrial Practice*

At present, in some institutions that have offered Python courses, the teaching content often remains at the level of simple grammar instruction and isolated cases divorced from financial scenarios, such as using Python to solve math problems or handle general datasets unrelated to finance. This teaching method leads to that although they have learned Python syntax, students have no idea how to connect it with their professional knowledge such as financial accounting, financial management, and financial analysis to solve practical financial problems, and there is a huge gap between “learning” and “practice” [5].

3.3 *The Conditions for Practice Teaching and the Faculty Force Are Insufficient*

Intelligent finance teaching requires high-quality environment for practice. It requires not only a computer room suitable for Python development and equipped with related libraries, but also a data, case and project task library that is close to the real enterprise environment. However, the practical training conditions in many institutions fail to meet this requirement. More importantly, the shortage of teachers is the core bottleneck. Computer teachers who are proficient in Python often have no idea of financial business, while accounting teachers who are familiar with financial business usually lack programming skills. This ‘technically proficient but business-illiterate, business-savvy but technically-deficient’ faculty structure severely constrains the deep implementation of interdisciplinary integration curricula.

3.4 *The Current Assessment System Is Difficult to Measure Students’ Comprehensive Ability*

The conventional assessment of finance courses is mainly based on closed-book exams, and emphasizes assessing the memorization of concepts, principles and computation rules. This assessment method cannot effectively assess students’ comprehensive ability to solve complex financial problems using Python. It is a problem that must be solved how to design a set of assessment criteria that can scientifically measure students’ ability throughout the whole process of data acquisition, data processing, model construction, result analysis and visual presentation.

4.The Pathways for the Deep Integration of Python and Intelligent Finance Courses under Industry-Education Integration

To systematically address the above-mentioned challenges, it is necessary to rely on industry-education integration and build a teaching implementation framework that features school-enterprise collaboration and theory-practice integration.

4.1 *Adopting Industry-Led Curriculum Design to Reconstruct a Business-Oriented, Spiral-Progressive Content System*

The development of curriculum content must abandon the “technology-oriented” thinking and adopt the “business-oriented” logic. Schools and enterprises should jointly form a curriculum development team. Based on the

four main application scenarios of Python in intelligent finance mentioned above, the curriculum content should be reframed into several teaching modules corresponding to real working processes.

4.1.1 *Fundamental Module*

The fundamental module can adopt "financial data visualization" as its entry point because its results are intuitive and easy to arouse students' interest in learning. For instance, in the first class, students can read a simple sales Excel table with Pandas and draw a sales trend table with Matplotlib, which makes students gain a sense of accomplishment immediately. During this process, core syntax knowledge, such as variables, data types, and data structures (Series, DataFrame), is naturally integrated into.

4.1.2 *Core Practice Module*

The core practice module can design its teaching units around core financial functions such as financial statement analysis, cost accounting, and budget management. For instance, teachers can guide students to write Python programs to automatically calculate key financial ratios of a company such as debt-paying ability, operation capacity, and profitability, and generate a financial analysis report with excellent texts and pictures.

4.1.3 *Advanced Extension Module*

The advanced extension module can integrate with machine learning cases. For instance, teachers can use the desensitized customer data from partner enterprises to allow students to build a simple customer churn prediction model or credit rating model. In this way, Python syntax, financial knowledge and data analysis thinking are organically integrated into each specific business scenario, achieving a "spiral-progressive" ability improvement.

4.2 *Co-Creating and Sharing Resources to Build a "Virtual-Real Combined and Project-Driven" Practice Teaching Platform*

Practice is the bridge connecting knowledge and ability. On campus, it is necessary to cooperate with enterprises to jointly build an "Intelligent Finance Training Center", and deploy an integrated teaching platform that includes rich financial databases and case libraries. This platform should preset desensitized real data from cooperative enterprises or high-fidelity enterprise simulation data for students to conduct simulation training. Outside the campus, practice classrooms can be extended to enterprises by establishing close school-enterprise cooperation bases. The following models can be adopted.

4.2.1 *Project Implantation Model*

Colleges and universities can set the real and non-core financial data analysis tasks of enterprises, such as supplier data organization, sales expense analysis, as the topics for curriculum design or graduation project, enabling students to "solve authentic financial problems".

4.2.2 *Industry Mentor Model*

Colleges and universities can engage financial analysts and data scientists from enterprises as industry mentors, who regularly give lectures, set up workshops, or directly guide students' projects to bring students with the cutting-edge industry perspectives and practical experience.

4.2.3 *Workshop-Based Practical Training*

Colleges and universities can organize students to participate in short-term intensive training camps with the theme of "Python Intelligent Finance" in enterprises can during winter and summer vacations, enabling students to finish a complete project in real workplace environment.

4.3 *Integrating Full-Time and Part-Time Teachers to Cultivate a Double-Qualified Teaching Team with Inter-Disciplinary Integration and Competency Complementarity*

Teachers are the key to the success of a course. It is necessary to adopt a strategy that combines "internal cultivation" with "external recruitment" to build an interdisciplinary teaching team.

4.3.1 *Implementing the Teacher Competency Enhancement Plan*

Colleges and universities can make incentive policies to encourage and support finance teachers to participate in Python technology training and enter the finance department or information department of cooperative enterprises for post practice to accumulate practical experience.

4.3.2 *Establishing a Resource Library for Industry Experts*

Colleges and universities can steadily engage a group of experts who are proficient in both technology and finance from cooperative enterprises, software companies, accounting firms and other institutions as part-time teachers to undertake the teaching tasks of the core practice module.

4.3.3 *Implementing the "Dual-Mentor" Co-Teaching Model*

In integrated project-based teaching, attempts can be made to have full-time finance teachers and enterprise technical experts jointly teach and guide students. Finance teachers are responsible for explaining business logic and financial rules, while technical experts are in charge of guiding technical implementation and code optimization. The two complement each other to provide students with the most comprehensive support.

4.4 *Adopting Process-Oriented Approaches to Innovate a Multi-Dimensional, Ability-Focused Assessment Mechanism*

The reform of the assessment mechanism serves as the baton. It is necessary to establish a comprehensive assessment system that takes ability assessment as the core and combines process-oriented assessment and summative assessment.

4.4.1 *Strengthening Process-Oriented Assessment*

Colleges and universities can reduce the weight of final exams and distribute Assessment Across the Learning Cycle, score the project outcomes of each teaching module, such as crawled datasets, cleaned data tables, analysis reports, visual charts, predictive models, to assess the standardization of their code, the accuracy of the results, the depth of the analysis, and the professional rigor of the reports.

4.4.2 *Introducing Multi-Stakeholder Assessment*

In addition to teacher assessment, colleges and universities can introduce enterprise mentor assessment, peer assessment and student self-assessment. During the project defense session, enterprise experts are invited to engage in the student review and give an evaluation from the perspective of industry application.

4.4.3 *Emphasizing Portfolio Assessment*

Colleges and universities can encourage students to create their own electronic portfolios to fully document all the projects they have completed and the practical problems they have solved throughout the learning process. These portfolios are not only a proof of learning achievements but also a powerful weapon for job hunting in the future.

5.Conclusion

In the wave of industry-education integration, it is an educational reform aimed at cultivating future-ready financial elites to deeply integrate Python technology into the intelligent finance courses in vocational undergraduate education. It is by no means simply adding a programming course to the existing curriculum, but rather a transformative restructuring of the entire financial talent cultivation ecosystem — educational philosophy, content and models. Its success is highly dependent on the close collaboration and synergetic development of the educational circles and the industrial circle. By adopting industry-led teaching content, conducting project-driven practice teaching, breaking through the bottleneck of teaching team via school-enterprise collaboration, and reforming assessment mechanism with Ability-orientation, we can bridge the chasms spanning theory and practice, and the classroom and the workplace. This enables students to master a red-hot technology. More importantly, it cultivates their core ability to solve complex financial problems with computational thinking and their lifelong learning ability

to adapt to future industry changes. Only in this way can vocational undergraduate education successfully accomplish their mission and provide the society with a large number of new financial talents who can master intelligent tools and empower the digital transformation of enterprises, thus writing a new chapter in financial education in the era of digital economy.

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