

Research on the Construction of the 'Fundamentals of Financial Big Data' Course: A Case Study of Wenzhou Polytechnic

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Abstract: With the continuous development of big data technology, the financial sector has raised its expectations for accounting professionals, demanding higher digital capabilities. In response to these talent cultivation requirements, many higher vocational colleges have introduced courses on big data technology. This paper selects the newly introduced course "Fundamentals of Financial Big Data" at Wenzhou Polytechnic as a case study to examine the current state and challenges of the course's construction, and proposes strategies and recommendations. These include accelerating the development of teaching resources; strengthening teacher training and development; deepening teacher-student communication and interaction; and expanding channels of cooperation between schools and enterprises. Course reform should be student-centered, guided by a combination of theory and practice, contextualized within real-case scenarios, and supported by digital resources, to comprehensively enhance the quality of education. The construction of the course should meet the new demands of the big data era, cultivating students' data sensitivity, data analysis skills, and digital innovation thinking, thereby laying a solid foundation for their future professional development.

Keywords: Big Data, Accounting, Course Construction, Curriculum Reform.

1. Introduction

In the context of digital intelligence, the rapid development of big data technology has profoundly impacted the accounting industry. It has not only transformed the way financial information is processed but also redefined the framework of professional knowledge and skills in accounting. As corporate financial management progressively transitions towards digitization and intelligence, higher digital competencies, especially in big data processing and financial data analysis, are increasingly demanded from accounting professionals. Consequently, higher vocational colleges, as vital institutions for nurturing accounting talents, urgently need to deeply reform digital finance courses, such as "Fundamentals of Big Data in Finance," to meet the demands of talent cultivation in this new era.

Through curriculum reform, the objective is to cultivate accounting students' big data mindset and skills, establishing abilities to analyze financial data and unearth the value of financial information, thereby enhancing students' comprehensive qualities in solving complex financial issues through digital skills. Curriculum reform requires not only an update of teaching content, integrating digital tools like Python, SQL, Power BI, RPA, etc., but also a full integration of financial application cases, coupled with innovative teaching methods such as flipped classrooms and project-based learning, to strengthen students' practical application abilities.

Existing research primarily offers a high-level perspective, proposing overall thoughts and frameworks for the digital transformation of accounting courses. However, there is a notable lack of analysis on the current state of practical application in curriculum reform, leading to a scarcity of specific measures and suggestions for actual teaching reforms.

This paper first analyzes the current societal demands for digital skills in accounting talents and the thought process

behind curriculum reform in higher education. Then, taking a Chinese vocational and technical college as an example, it explores the current status and main challenges faced by the reform of the "Fundamentals of Big Data in Finance" course in higher vocational colleges, such as insufficient teaching resources, and the mismatch between teachers' professional capabilities and the pace of updates. Employing a comprehensive approach using literature analysis, case studies, and analysis of teaching practices, this study proposes corresponding countermeasures and suggestions for curriculum reform. It aims to provide theoretical support and practical guidance for the reform of the "Fundamentals of Big Data in Finance" course in higher vocational colleges, promote the close integration of accounting education with industry development, and contribute to nurturing high-quality accounting professionals who can meet the demands of the new era.

2. Literature Review

The exploration of Python programming's innovative application in accounting education reflects a broader academic interest in integrating digital technologies into the curriculum, addressing the evolving demands of the accounting profession. This literature review methodically synthesizes insights from recent studies, underscoring the significance of digital transformation in accounting education, the integration of big data and technology, the infusion of data analytics into the curriculum, and the challenges and solutions related to these advancements.

Firstly, The integration of big data and technology into accounting education is emphasized by Sledgianowski, Gomaa, and Tan (2017), who argue for the necessity of incorporating technological competencies and data analytics into the accounting curriculum. This adaptation is essential to align educational outcomes with the profession's evolving requirements. The necessity for accounting programs to

evolve in response to technological advancements and professional shifts is highlighted by Pincus et al. (2017). This adaptation is crucial for maintaining relevance and effectiveness in a rapidly changing educational landscape. Similarly, the demand for technology and information system expertise in the accounting profession, as highlighted by Suarta, Suwintana, and Sudiadnyani (2022), necessitates the integration of these skills into the accounting curriculum.

Furthering the discourse, Al-Htaybat, Alberti-Alhtaybat, and Alhatabat (2018) discuss the impact of the digital revolution on the accounting profession, advocating for curriculum adjustments to include a balance of traditional and contemporary skills. Dzurinin, Jones, and Olvera (2018) propose a comprehensive framework to infuse data analytics into the curriculum, advocating for a hybrid educational approach that merges standalone courses with integrated curriculum-wide initiatives. Dow, Jacknis, and Watson (2021) extend this paradigm by offering resources for developing a data analytics-infused curriculum, leveraging the Diffusion of Innovation Theory to facilitate the practical integration of data analytics in teaching. Furthermore, the efficacy of innovative teaching tools, such as interactive applications for learning financial statements, is explored by Din et al. (2018), demonstrating the potential of interactive tools to enhance student engagement and learning outcomes in accounting education.

Specifically, this study aims to analyze the current situation and corresponding solutions of accounting course transformation in higher education. There has been growing interest in application of Python programming in accounting education. This is because Python is a powerful data analysis tool and also an easy accessible programming language for non-computer major.

The application of Python in teaching management accounting is demonstrated through domain-specific examples by Schoute (2019), facilitating the simultaneous learning of accounting principles and programming skills. Guo (2021) and Peng, Chen, and Li (2021) further discuss Python's utility in textual accounting research and its role in pedagogical reform within the context of artificial intelligence. Rahmawati, Susilowati, and Eltivia (2022) investigate the effectiveness of desktop game applications developed with Python in enhancing learning outcomes, indicating the method's potential to improve engagement and understanding through interactive learning mediums.

There has been growing interest in accounting course transformation in higher education. Fang and Wang (2021) propose innovative training systems that leverage digital intelligence technology, emphasizing the integration of digital technologies into the curriculum to prepare accounting talents for the digital economy. Similarly, the importance of continuous education for accountants in the digital economy is emphasized by Volokhin, Mukhametzyanova, and Khairutdinov (2021), underlining the development of digital competencies as essential for effectively leveraging digital technology. Furthermore, the inclusion of e-accounting and industry 4.0 technologies in accounting education is assessed by Bağdat (2022), highlighting the alignment of accounting curricula with the digital transformation process as critical for adequately preparing students for future challenges.

In conclusion, the digital transformation of accounting courses in higher education necessitates careful planning, innovative curriculum development, and the integration of digital technologies to equip students for the modern

accounting landscape. This literature review underscores the collective efforts and strategies proposed by researchers to address the challenges and leverage the opportunities presented by the digital revolution in accounting education.

However, recent studies mainly focus on a higher perspective for accounting curriculum transformation. There is hardly any research investigating the current situation in real education environment and a specific course. Therefore, there is a lack of corresponding solutions and specific suggestions targeted for accounting curriculum transformation in higher education.

In order to address the issue, this study takes a Chinese polytechnic college as an example, investigates a specific course named "Fundamentals of Big Data Application in Accounting", and analyzes the difficulties of accounting curriculum transformation in real education environment. Moreover, this study provides corresponding solutions regarding the difficulties incurred, and also give some suggestions for accounting curriculum transformation in a higher and broader perspective.

3. The Transformation Direction of Accounting Talents' Knowledge and Skills in the Digital Era

According to the "14th Five-Year Plan" released by the Ministry of Education of China, the Education Informatization 2.0 Action Plan explicitly calls for a deepening of the digital transformation of education and teaching, and advocates for the innovation of educational models and content. For accounting education, this signifies the necessity to integrate digital technologies such as big data, cloud computing, and artificial intelligence, to reform the accounting curriculum, and to incorporate big data technology into traditional accounting courses. This aims to cultivate students' abilities in data analysis, data processing, and data mining of big data and financial data, thereby enhancing the comprehensive digital literacy of accounting talents.

In the era of digitalization, big data technology has become a key tool for businesses to enhance operational efficiency, optimize decision-making processes, and strengthen competitiveness. Big data technology, through the analysis of massive data sets, reveals profound insights into business operations, customer behavior, and market trends, providing a scientific basis for corporate decision-making. In this process, the specific applications of big data technology in businesses are extensive, and they pose new requirements for financial personnel.

Firstly, accounting talents need to master the use of digital tools (such as Python, SQL, Power BI, RPA, etc.). With the widespread application of digital technology in the field of accounting, traditional accounting workflows and methods are being redefined. Accounting is no longer just about the recording and reporting of numbers; it is increasingly about interpreting and utilizing these data to support management decision-making. Mastering these digital tools is the most basic and essential requirement.

Take the Python language as an example. Python has become one of the essential skills that accounting talents must master due to its powerful data processing and analysis capabilities. As an advanced programming language, Python is known for its concise syntax, robust library support, and extensive community resources, making it particularly

suitable for data analysis, machine learning, automation scripting, and financial modeling. Firstly, Python can significantly improve the efficiency of accounting professionals in processing and analyzing financial data. By using Python, accounting professionals can automate the tedious data collection and cleaning tasks, such as extracting financial statement data from different sources and removing duplicate or erroneous information, thereby saving a considerable amount of manual processing time. Additionally, Python's Pandas library provides a wealth of data structures and analysis tools, making complex financial data processing simple and efficient. Secondly, Python's application in financial analysis and forecasting is extremely broad. By learning Python, accounting talents can use statistical and machine learning algorithms to analyze historical financial data, identifying potential financial risks and investment opportunities. For instance, using Python's SciPy and NumPy libraries for financial modeling and risk assessment, or utilizing Python's Scikit-learn library to build predictive models, predicting corporate earnings trends and market changes. Furthermore, Python supports advanced data visualization tools, such as Matplotlib and Seaborn libraries, enabling accounting talents to present complex data analysis results in a graphical form, improving the readability and persuasiveness of reports. This is particularly important for communicating financial conditions and business insights to management or investors. Moreover, Python's wide application also includes automating financial reporting, building financial dashboards, and automating tax calculations. By writing Python scripts, accounting talents can automate the generation of financial reports, update financial indicators in real time, thereby providing timelier and more accurate financial information to support rapid decision-making.

Secondly, accounting talents need to possess data analysis capabilities. Accounting talents need not only the ability to use various software but also the ability to apply statistical, data mining methods to analyze financial data, identifying business trends, risks, and opportunities, and providing management with data-based insights and suggestions. The specific applications of big data technology in businesses include, but are not limited to, automated financial reporting, risk management, budget preparation and control, investment decision support, and customer and market analysis. By utilizing big data analysis tools, businesses can automatically generate financial reports, reducing human errors and improving the accuracy and timeliness of reports. In terms of risk management, big data technology can help businesses identify, assess, and monitor financial risks, and predict future risks through in-depth analysis of historical data. Big data can also support businesses in more accurately forecasting revenue and costs during budget preparation, optimizing resource allocation. Moreover, accounting personnel need to understand and be familiar with the operation of big data analysis tools, cloud computing platforms, and the application of blockchain technology in accounting and auditing. Digital tools can not only effectively improve the efficiency and accuracy of financial personnel in processing data but also help them fully explore the intrinsic value of data, thereby enhancing their competitiveness in employment.

Thirdly, accounting talents need to establish digital thinking. Digital thinking emphasizes a data-driven decision-making process. In traditional accounting practices, decisions often rely on historical data and experiential judgment, with

accounting personnel making judgments based on corporate historical information, which may lack accuracy and timeliness. However, in a digital environment, through big data analysis, cloud computing, and other technologies, accounting talents can obtain and process a large amount of data in real-time, thereby making more precise and forward-looking decisions. Therefore, accounting talents need to cultivate a thinking pattern based on data analysis and use digital tools to improve the efficiency and effectiveness of decision-making. At the same time, digital thinking requires accounting talents to possess interdisciplinary knowledge structures. In the context of digitalization, accounting work is not limited to traditional financial reporting and auditing but also involves data analysis, information technology, and even artificial intelligence. Therefore, accounting talents need to broaden their knowledge fields, possess interdisciplinary thinking methods and knowledge structures, including computer science, data analysis, economics, law, etc., and understand and analyze the business models and market trends behind financial data, providing powerful data support for corporate strategic planning. Only by establishing digital thinking can accounting talents fully participate in the digital transformation strategy of enterprises, utilizing financial data and digital tools to contribute to the long-term development and competitive advantage of enterprises.

In summary, the transformation direction of accounting talents' knowledge and skills in the context of digitalization should focus on mastering and applying information technology tools, building interdisciplinary knowledge structures, enhancing innovative consciousness and learning ability, and strengthening communication and collaboration skills. Through this transformation, accounting talents can better adapt to the requirements of the digital age, contributing to the development of the accounting industry. Correspondingly, the reform of college accounting courses should start from the above three aspects, comprehensively reflecting and improving talent training programs, course standards, overall course design, and unit design, rationally designing courses, and cultivating students' digital skills.

4. The Current Status of Curriculum Reform for 'Fundamentals of Financial Big Data' in Higher Vocational Colleges

(I) An Analysis of the Overall Current Status of Curriculum Reform for 'Fundamentals of Financial Big Data' in Chinese Higher Vocational Colleges"

The digital reform of accounting courses involves not only the restructuring of professional talent training programs but also extends to the pedagogical reform of each individual course. To cultivate digital skills in accounting students, many higher vocational colleges have introduced courses such as 'Fundamentals of Financial Big Data', 'Applications of Big Data in Finance', and 'Applications of Big Data in Finance and Taxation'. These courses cover skills in big data tools like Python, SQL, and Power BI, laying a solid foundation for digital applications in finance.

This article takes the 'Fundamentals of Financial Big Data' course as an example to explore the current status and challenges faced by higher vocational colleges in curriculum reform. Presently, the reform of the 'Fundamentals of Financial Big Data' course in higher vocational colleges is mainly reflected in the following aspects: First, the

integration of big data tools and technologies into the curriculum. The course primarily teaches the use of big data technologies and tools, laying the groundwork for subsequent data analysis and financial data mining applications, and is a fundamental compulsory course for accounting students. It uses Python as a medium to teach basic and advanced syntax and the use of data analysis modules in Python. Second, many higher vocational colleges have upgraded their big data training labs and equipped them with practical software, providing students with a conducive learning environment for big data technology. Third, the development of teaching staff. The majority of university teachers previously lacked a foundational knowledge of big data technologies. At this stage, most colleges have already initiated preliminary training in big data technology and applications for their teachers, fostering the digital capabilities of their teaching staff. With the updating of talent training programs, some teachers have started teaching big data courses in the past two years. Fourth, innovation in teaching methods. With the new curriculum, the content of teaching has shifted from traditional accounting theory to big data technology skills, and correspondingly, the teaching methods and means have also changed. Some universities have adopted diversified teaching methods such as case teaching, project-driven learning, and flipped classrooms, aiming to enhance students' active learning abilities and problem-solving skills.

(II) Analysis of the Current State of 'Fundamentals of Financial Big Data' Course Reform at Wenzhou Vocational and Technical College

Wenzhou Polytechnic, a full-time comprehensive higher vocational college established in 1999 with the approval of the Ministry of Education of China, is recognized as a national model vocational college. The college's Department of Finance and Accounting initiated a major reform in 'Big Data and Accounting' in 2020, revising the 2021 curriculum and talent training program to fully integrate courses in big data tools and digital skills. In the second half of 2023, the college offered the 'Fundamentals of Financial Big Data' course for the first time, with faculty members teaching the course to students for their first experience. This paper will analyze the current status of the course in terms of curriculum design, faculty training, textbook use, and student proficiency.

Firstly, the 'Fundamentals of Financial Big Data' course offered by the college comprises 48 hours, with 3 hours per week over 16 weeks, and is conducted in the newly established training lab. The course aims to enable students to master basic and advanced Python syntax and data analysis knowledge, applying big data technology and Python in financial data analysis. It focuses on developing students' ability to discover and utilize data, clean and process data, select data analysis methods, analyze data, and visualize results. The teaching method combines lectures and practice, including detailed explanations of key points, teacher demonstrations, student extrapolations, group discussions, and case applications, to help students consolidate their learning and apply it to finance.

Secondly, after training by the school and self-study by the teachers, the current faculty is capable of undertaking teaching responsibilities. The initial 'Fundamentals of Financial Big Data' course team included five young teachers, all skilled in teaching Python syntax and possessing some data analysis capabilities. Most teachers participated in training during the vacation before the course started, while a few had already independently studied Python and had a good

foundation. As young teachers, they generally have a higher receptivity to new knowledge and a quicker learning pace for new technologies, allowing them to quickly adapt to the teaching tasks of new big data courses. However, being in the exploratory phase of the new course, teachers lack teaching experience, and their abilities in course design and case integration need enhancement. Although students can grasp and understand the teaching points, they lack a clear concept of the application of Python in finance.

Thirdly, there are some newly published big data Python textbooks, and the college has subscribed to textbooks from the same company as the training platform. The textbooks are clearly modular and largely consistent with the training platform's content. However, after actual use by 13 classes and teachers, many students reported that the logic of the current textbooks is not clear enough, making it difficult to locate required knowledge points and to provide effective assistance for previewing and reviewing. The utilization rate of the textbooks is low.

Fourthly, students lack a programming foundation, and some encounter difficulties in the introductory phase of the course. Additionally, students in higher vocational colleges generally lack self-motivation and initiative in learning. This leads to ineffective preparation and review between weekly classes. With a one-week interval between classes, if programming language learning is not promptly consolidated and practiced, it becomes difficult to understand and grasp the logic of the code, thus affecting learning outcomes. Only a few students are able to understand and proficiently use Python for creative programming.

5. Challenges in the Digitalization Reform of Accounting Education in Higher Vocational Colleges

Despite certain achievements in the curriculum reform of "Financial Big Data Fundamentals" in higher vocational colleges, numerous challenges persist.

Firstly, there is a deficiency in course resources. The digitalization reform in accounting education is still in its nascent stage, and there is a relative scarcity of high-quality teaching resources and case studies, which restricts the richness and practicality of the teaching content. This includes a lack of updated textbooks, case studies, practical operation platforms, and software tools relevant to actual financial data processing. Due to the scarcity of quality teaching resources, the course content often fails to fully cover various aspects of financial big data processing, or the teaching cases are disconnected from actual business practices, lacking practicality. This limits students' learning experiences and skill acquisition, hindering their ability to effectively integrate theoretical knowledge with practical operations, thereby affecting their employability. For example, Wenzhou Vocational and Technical College selected textbooks developed by a training platform company. As this was the first time the course was offered at the college, the teachers had not yet authored materials tailored to the specific learning needs of their students. Moreover, the development of textbooks not only requires teachers to have sufficient practical application experience but also necessitates continual refinement and pedagogical trials before publication.

Secondly, there is an unevenness in teacher capabilities. Some teachers lack practical operational experience in big

data technology, making it difficult to meet the actual application demands of the course. Furthermore, the application of big data technology requires teachers to possess not only solid accounting professional knowledge but also relevant data science and technical knowledge. However, many teachers in higher vocational colleges currently may lack sufficient training and practical experience in this area, making it challenging to effectively guide students in learning the latest big data technologies and tools. For instance, at Wenzhou Vocational and Technical College, the majority of the teaching staff do not have a background in computer science and learned big data technology only after joining the institution. They generally lack practical application experience in enterprises and have a limited understanding of the actual application scenarios and cases of big data technology. In such circumstances, although students may learn Python language skills in the classroom, they lack insight into its application in finance. Without subsequent advanced courses as a supplement, Python language skills might not provide technical support for students' post-graduation employment, resulting in the current insufficiency in the applicability of the course.

Thirdly, there is inadequate collaboration between schools and enterprises. Currently, higher vocational colleges are still in the preliminary stage of offering big data courses and lack experience in the practical application of big data technology in enterprises. Additionally, due to the limited understanding of the value of big data technology in finance among local small and medium-sized enterprises, many colleges have not yet established cooperative relationships with businesses. Without school-enterprise collaboration, teachers find it challenging to design financial cases that are more closely aligned with practical applications based on their own practical experiences, and students lack opportunities for technological application and internships.

6. Suggestions for the Construction of the "Financial Big Data Fundamentals" Course

In response to the aforementioned issues, this paper proposes the following suggestions for the construction of the "Financial Big Data Fundamentals" course.

Accelerate the Development of Teaching Resources. Theoretical teaching needs to be combined with practical cases. Higher educational institutions should promptly develop and introduce more high-quality teaching resources and cases, compiling textbooks suitable for the ability level of students in higher vocational colleges. Teaching resources should fully integrate cases closely related to actual financial data processing to enhance students' learning interest and practical skills. Simultaneously, expedite the development of digital teaching resources. Utilize digital technologies (such as online course platforms, interactive software, simulation tools, etc.) to enrich students' learning experiences. For instance, create online instructional videos and self-assessment tests.

Strengthen Teacher Training and Development. As big data technology evolves rapidly, higher education institutions should timely organize teachers to participate in training on big data technology and applications, enhancing their professional capabilities in this field for better course construction. This can be achieved through online training, expert lectures, inter-university exchanges, and team

discussions to solidify and enhance teachers' technical abilities. Teachers should continually update course content according to the latest developments in big data technology and applications, ensuring the course reflects the current trends in technology and the industry.

Deepen Teacher-Student Communication and Interaction. Classrooms should be designed with ample teacher-student interactive segments, actively involving students in practical training courses. At the same time, strengthen teacher-student communication to fully understand students' pain points and difficulties in the learning process, thereby continually improving course design. For example, conducting course surveys mid-semester and at the end of the semester to understand and analyze student learning characteristics for targeted improvements.

Broaden Cooperation Channels. Higher vocational colleges can cooperate with enterprises and industries to offer internships and project-driven courses, allowing students to learn and apply big data technology in actual work environments, thus enhancing the practicality and applicability of the course. For example, by collaborating with enterprises, obtain anonymized financial data from businesses, enabling students to learn and practice in real business scenarios. Meanwhile, enterprises can also discover processes that can be optimized through this cooperation, thereby improving operational efficiency.

The "Financial Big Data Fundamentals" course in higher vocational colleges is undergoing continuous reform and optimization. Course reform should be student-centered, guided by the integration of theory and practice, based on real cases, and supported by digital resources, comprehensively improving teaching quality. Course construction should meet the new demands of the big data era, cultivating students' data sensitivity, data analysis capabilities, and digital innovative thinking, laying a solid foundation for their future career development.

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