

# Application and Exploration of Business Data Analysis Competency in the Course "Fundamentals of Statistics and Business Data Analysis"

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**Abstract:** With the advent of the big data era, business decisions increasingly rely on profound insights extracted from massive amounts of data. In order to adapt to this change, this article explores an innovative design and implementation strategy for the course "Statistical Fundamentals and Business Data Analysis" aimed at vocational high school students. This course aims to cultivate students' ability to apply basic statistical knowledge and data analysis skills in the business environment. It not only strengthens the teaching of theoretical knowledge, but also focuses on the cultivation of practical operation skills to ensure that students can flexibly apply statistical principles to complex and ever-changing business scenarios. The innovative design and implementation of the course "Fundamentals of Statistics and Business Data Analysis" not only enhances students' business analysis abilities in the big data environment, but also lays a solid foundation for their future career. Through the curriculum design concept of "integration", "integration", "depth", and "liveliness", and the teaching process of "pre class diagnosis in class teaching post class supervision", this course effectively promotes the comprehensive improvement of students' comprehensive literacy and demonstrates the positive role of vocational education in responding to the needs of the times and cultivating high-quality skilled talents.

**Keywords:** Statistical Fundamentals; Business Data Analysis; teaching reform

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## 1. Introduction

In today's information era, with the rapid development of big data technology, business data analysis has become a critical driving force for corporate decision-making, optimizing operational strategies, and exploring market potential. From customer behavior analysis in retail to risk assessment in finance, and trend prediction in healthcare epidemiology, the application scope of data analysis techniques is increasingly broad, leading to a surge in demand for specialized talent. Against this backdrop, higher vocational education, as a crucial bridge between theory and practice, education and employment, faces the urgent task of cultivating professionals with solid statistical theory foundations and strong data processing and analytical capabilities.

The course "Fundamentals of Statistics and Business Data Analysis," as an integral part of the interdisciplinary field of business and information science at vocational colleges, bears the dual mission of laying a solid foundation of statistical knowledge for students while also fostering their ability to use data analysis tools to solve practical problems in complex business environments. However, traditional teaching models often overemphasize theoretical instruction, lacking close alignment with industry needs and timely incorporation of new technologies and methods, which to some extent limits the cultivation of students' practical and innovative abilities.

Therefore, this research aims to thoroughly explore the teaching practices and reform paths of the course "Fundamentals of Statistics and Business Data Analysis" in cultivating business data analysis competencies. Through the optimization and upgrading of existing curriculum systems, the innovative application of teaching methods, and the construction and improvement of practical teaching systems, it aims to establish an educational system that meets the

demands of the modern business environment and can effectively enhance students' data analysis abilities. The core of the study lies in balancing theoretical teaching with practical operations, utilizing the latest information technology to enhance teaching interactivity and effectiveness, and providing students with learning opportunities close to real-world work scenarios through deep cooperation with enterprises.

Furthermore, this study will focus on the challenges and opportunities in the process of teaching reform, such as continuously updating teaching content to follow technological developments, improving the professional skills and teaching abilities of the faculty, and evaluating and ensuring the implementation effects of teaching reforms. Through comprehensive analysis and empirical research, this report expects to provide practical guidance and theoretical support for the reform of the "Fundamentals of Statistics and Business Data Analysis" course, contributing valuable insights and recommendations to the modernization transformation of China's higher vocational education system.

## 2. Literature review

### (1) Foreign Research

Internationally, research on business data analysis education started earlier, especially in regions like the United States and Europe, where many higher education institutions have incorporated business data analysis into their core curriculum systems. Studies show that foreign universities generally emphasize the combination of theory and practice, adopting various teaching methods such as case analysis, simulation projects, internships, and practical training to enhance students' practical operational abilities (Brown, 2015). For example, Harvard Business School's "Business Analytics" course focuses on solving complex business problems through interdisciplinary collaborative projects,

allowing students to learn through practice (Kim et al., 2018). Additionally, some studies highlight the importance of technical tools, such as the increasing application of programming languages like R and Python in data analysis courses (James et al., 2020).

#### (2) Domestic Research

In recent years, China has also made significant progress in the field of business data analysis education. In response to the national strategy of "Big Data," vocational colleges have stepped up efforts to strengthen the cultivation of data analysis talents. Domestic scholars' research focuses on curriculum system construction, innovation in teaching models, and exploration of school-enterprise cooperation models (Li Ming, 2019). Some studies point out that domestic course design is gradually moving towards equal emphasis on theory and practice, emphasizing problem-oriented teaching methods, but it also faces issues such as insufficient faculty resources and incomplete construction of practical platforms (Wang Li, 2021). Chen Yue (2022) believes that currently, most students in economics and finance majors have relatively weak data analysis abilities, requiring high emphasis on cultivating these abilities in the teaching process. Teachers need to integrate in-class and out-of-class teaching to stimulate students' interest and enthusiasm for data analysis, fostering habits and awareness of data analysis to improve students' data analysis abilities and achieve better teaching outcomes. In terms of teaching methods, Zhao Qi (2022) suggests enhancing business data analysis abilities for new economic majors under the digital economy by reforming high-level professional clusters, focusing on the interaction between scientific research and teaching, and building a high-level faculty team. Dao Ning (2019) proposes practical teaching for data marketing courses based on IBM SPSS Direct Marketing software. By integrating SPSS software into marketing courses for marketing data analysis, students can develop data marketing thinking while mastering business data analysis technical methods. In terms of teaching philosophy, Cheng Peng (2021) introduces the OBE (Outcome-Based Education) concept into the "Fundamentals of Statistics and Business Data Analysis" course, forming a "job demand-cultivation goal-graduation requirement-capability indicator-curriculum system" chain of teaching "reverse design." Through theoretical teaching, case analysis, experiments, and other teaching links of statistics basics and business data analysis, students fully understand the value of the "Business Data Analysis" course. Shi Xiuhong (2021) proposes constructing a new economics major cluster centered on cultivating business data analysis abilities, structuring the curriculum system based on target job positions, and implementing teaching following the student-centered education philosophy. This ultimately achieves the goals of "one general, two specialties, three expansions" and "strong foundation, wide employment," effectively enhancing students' business data analysis abilities.

#### (3) Research Review

Statistics, as the foundation of business data analysis, its theoretical framework includes descriptive statistics, inferential statistics, non-parametric statistics, etc., providing necessary mathematical tools and methodologies for data analysis. The development of modern statistical theory, such as Bayesian statistics and data mining theory, offers new ideas and methods for addressing complex business problems (Casella & Berger, 2002). Existing teaching models are relatively mature in theoretical instruction, but there are still

shortcomings in practical teaching, integration of technological innovation, and cultivation of students' innovative abilities. On one hand, traditional classroom teaching cannot fully meet students' demand for practical operational skills; on the other hand, due to the fast pace of technological iteration, the untimely updating of course content leads to a disconnection between what students learn and industry realities. Therefore, how to construct a new teaching model that not only imparts solid theoretical foundations but also keeps up with technological frontiers and emphasizes practical operations and innovative ability cultivation becomes the key to current research and practice. In summary, domestic and foreign research provides a rich theoretical basis and practical experience for the teaching reform of the "Fundamentals of Statistics and Business Data Analysis" course, pointing out directions for improvement in curriculum content, teaching methods, practical platform construction, etc., and offering valuable references and inspirations for subsequent research and practice.

### 3. Current issues in statistical data analysis courses

#### (1) Low Data Sensitivity and Lack of Data Awareness

In current teaching, teachers still pay insufficient attention to data analysis, and students have unclear understanding of concepts related to data analysis, lacking data awareness. Learning the "Fundamentals of Statistics and Business Data Analysis" course can cultivate students' sensitivity to data.

#### (2) Inadequate Proficiency in Data Analysis Tools

There are numerous types of data tools used in current enterprises, including Excel, SPSS, SQL, Python, etc. In current teaching, teachers do not provide special practical training for any particular tool, resulting in fewer opportunities for students to engage in practical exercises. Students are relatively unfamiliar with relevant data analysis tools, lacking in data analysis capabilities. By reconstructing the "Fundamentals of Statistics and Business Data Analysis" course system, the focus is on enhancing vocational students' proficiency in data analysis tools such as Excel and SPSS.

#### (3) Insufficient Understanding of Corporate Operations

In current teaching, students, due to limited practical experience, cannot effectively combine data with operations, failing to comprehend the overall operation of enterprises from a holistic perspective. By reconstructing the "Fundamentals of Statistics and Business Data Analysis" course system and combining case teaching and project teaching methods, using real projects for practical training, students can familiarize themselves with specific aspects of the operational process, identifying the intrinsic connection between data and business operations, enabling them to extract precise and valuable information more effectively.

### 4. Application and Exploration of Business Data Analysis Abilities in the Course

#### (1) Teaching philosophy

Teaching philosophy of the "Fundamentals of Statistics and Business Data Analysis" course should adhere to the principles of "Integration," "Fusion," "Depth," and "Liveliness."

Integration: Reorganization and integration of textbook content; integration of knowledge points from related

economics courses on various online platforms. The purpose is to improve students' online learning efficiency, reduce time spent searching for resources, and adapt to students' management of fragmented time and demand for simplified, large-capacity, convenient learning packages.

**Fusion:** Industry-academia integration, integrating actual life cases, enterprise talent demands, and "Fundamentals of Statistics and Business Data Analysis" course teaching. First, closely related to life, integrating typical cases using statistical foundations and business data analysis under the pandemic with student activities and practice; second, closely related to market demands and enterprise needs, matching real enterprise data appropriately with practical content and conducting simulation teaching with real cases.

**Depth:** Aimed at empowering students, broadening their knowledge perspectives, stimulating innovative thinking, and cultivating self-learning potential. Online course content design should include certain in-depth knowledge points; upload more open and innovative learning materials on the learning platform.

**Liveliness:** Apply the cultivation of business data analysis abilities and innovative thinking to the teaching design process of the class, subtly cultivating students' creativity and imagination. Firstly, in content explanation, do not be confined to traditional theories in textbooks, focusing on the training of business data analysis skills; secondly, in teaching methods, do not be restricted to any teaching tools or technical means, but rather, how to stimulate students' learning interest through teaching content.

(2) Course Teaching Content

Currently, "Internet+Big Data" has become the main melody for talent cultivation in economics majors in the new era. Therefore, integrating Internet and big data thinking into the corresponding teaching of economics majors has become a necessary path to improve the quality of teaching in economics majors. Consequently, the focus of teaching content is on cultivating data analysis abilities.

During the pre-class teaching preparation stage, teachers release pre-recorded course videos, PowerPoint presentations, and other related learning materials on online discussion groups or learning platforms like LearningTong, urging everyone to conduct self-study online in advance. Using platforms like LearningTong and MOOCs, teachers can promptly understand students' learning progress and situations, collecting and analyzing data on the learning platform. For instance, by statistically analyzing students' review of knowledge points, teachers can discover students' learning focuses or weaknesses, preparing for more efficient classroom teaching. At this stage, different types of lesson plans need to be designed according to the different requirements of course teaching content. For example, for the course introduction section, design question-led lesson plans, mainly explaining what statistical foundations and business data analysis are and why we learn statistical foundations and business data analysis? Through step-by-step questioning, guide students to generate interest in the course. For sections on the market environment, product characteristics, and operating environment, design case-based lesson plan content. Through case demonstrations and explanations, introduce knowledge points step-by-step, helping students understand the application steps of theories. For data analysis parts, design scenario learning-style lesson plans. Through setting specific scenario backgrounds, introduce enterprise management decision-making problems, demonstrating

operations of data analysis tools to achieve data analysis and summarizing analysis results. The following table provides a design case for scenario learning-style lesson plans.

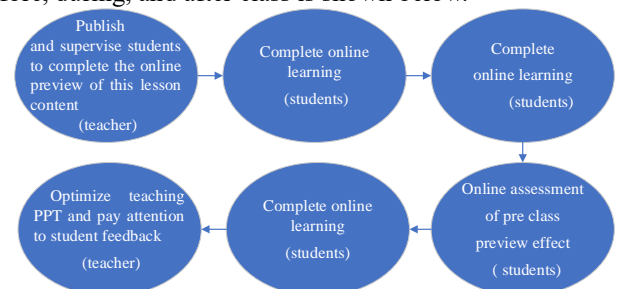
**Table 1.** A design case for scenario learning-style lesson plans

Teaching link	Teaching content	Time allocation
Problem introduction	Purpose: After understanding market capacity and market trends, which sub-industry in the electronics industry has development potential? Introduce the problem of "market potential analysis."	1 minute
Concept learning	Cake index = ratio of payment amount compared to parent industry / ratio of parent industry merchant number	2 minutes
Core knowledge points	Comparison and analysis of the relationship between cake index and market capacity, characteristics of blue ocean products	4 minutes
Skill knowledge points	Demonstration of cake index calculation operations in the electronics industry, specifically mobile phones knowledge points: PivotTable,calculated fields, radar chart Teaching methods: Excel operation demonstration,SPSS operation demonstration	4 minutes
Knowledge summary	Calculation method and application of the cake index	1 minute

During the classroom teaching process, the teaching form is project-based. Teachers understand students' existing basic knowledge based on learning and test information collected from teaching platforms. Under this premise, teachers detail knowledge points according to course content and design project cases, promptly releasing cases on online teaching platforms. In classroom teaching, students discuss, analyze, and perform practical operations around project cases. Project case tasks should be implemented differently based on students' actual levels. During implementation, teachers should provide timely assistance and guidance to students, and students can express questions or difficulties encountered in class at any time through online messages. Projects of a certain difficulty can stimulate students' learning interest and motivation, improving their mastery of data analysis tools like Excel and SPSS.

**Post-class teaching organization:** Students provide feedback on classroom learning and online homework submission, and teachers optimize teaching materials based on student feedback.

The closed-loop real-time feedback teaching process before, during, and after class is shown below.



**Figure 1.** Pre class process

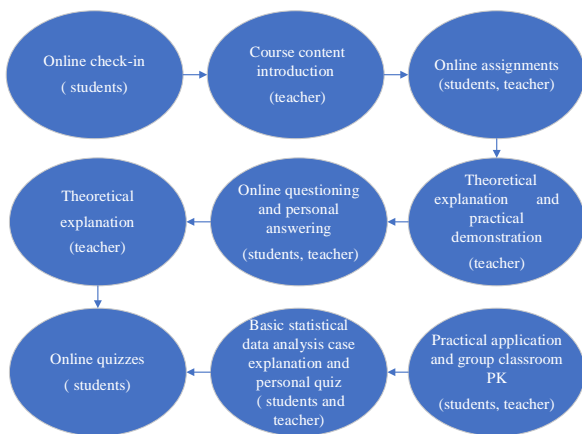


Figure 2. In class teaching segments

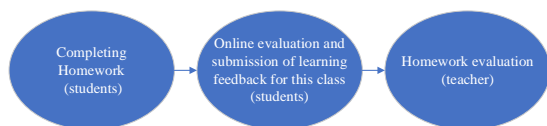


Figure 3. After class teaching session

### (3) Construction of Information Resource Library

During the project implementation process, team members improved the syllabus, course standards, teaching cases, student practical content, practical guidance manuals, etc. of the "Fundamentals of Statistics and Business Data Analysis" course, enriching the construction of the information resource library.

## 5. Implementation Results and Evaluation

### (1) Student Feedback and Learning Outcomes

Through questionnaires, individual interviews, and self-assessments conducted after completing the "Fundamentals of Statistics and Business Data Analysis" course, we have collected rich feedback information, which directly evidences the evaluation of course implementation effects. Students generally stated that the project-driven learning method significantly enhanced their interest and participation, allowing them to better understand and master statistical theories and data analysis tools while solving problems. Specifically, through participating in real or simulated business data analysis projects, students expressed that they not only learned how to use tools like Excel and SPSS to process data but also learned how to propose hypotheses, design analysis plans, and make decisions in complex situations.

According to surveys, approximately 85% of students believed that the course content was highly aligned with current industry demands, especially the newly added content on data analysis and data visualization, which greatly boosted their confidence in future career development. Moreover, over 90% of students indicated that practical sessions, such as case analysis, software operation exercises, and team projects, significantly improved their hands-on abilities and teamwork spirit.

### (2) Specific Indicators of Teaching Effectiveness

**Skill Certification:** After course reform, over 60% of students expressed their intention to obtain relevant data analysis skill certifications, such as data analyst certification,

after the course.

**Quality of Project Completion:** By evaluating students' submitted project reports and data analysis outcomes, it was found that most projects showed significant improvements in data processing accuracy, rationality of model selection, clarity of result interpretation, particularly in innovation and practicality when solving actual problems.

### (3) Continuous Improvement and Optimization Strategies

Although the overall implementation effect is positive, it is still necessary to continuously collect feedback and optimize the curriculum. According to the evaluation results, future improvement directions mainly include the following aspect.

**Enhanced Faculty Training:** Regularly organize teachers to participate in professional training and academic exchanges to improve their teaching abilities in new technologies and methods, especially in cutting-edge areas such as artificial intelligence and deep learning.

**Optimized Course Content:** Adjust course content based on industry trends and student feedback, incorporating introductions and practices of the latest data analysis tools and technologies to ensure timeliness and forward-looking nature of the course.

**Strengthened School-Enterprise Cooperation:** Deepen cooperation with enterprises, not limited to internship base construction, but also including joint development of teaching cases, workshops, inviting industry experts to teach, etc., further narrowing the gap between education and actual work.

**Establishment of a Long-Term Assessment Mechanism:** Establish a multidimensional assessment system including student evaluations, peer reviews, and enterprise feedback to regularly comprehensively evaluate teaching effectiveness, ensuring continuous improvement of teaching quality.

In summary, through the implementation of a series of teaching reform measures, the "Fundamentals of Statistics and Business Data Analysis" course has achieved significant results in enhancing students' data analysis abilities, promoting the combination of theory and practice, and enhancing employability competitiveness. In the future, it will continue to track industry development, optimize course structure, deepen teaching method reforms, to cultivate more high-quality business data analysis talents that meet market demands.

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