

Exploration of Teaching Reform in Statistics for Economics Majors in the Context of the Digital Economy

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ABSTRACT

Driven by the dual forces of information technology and innovation, the digital economy has developed rapidly, now exceeding 55 trillion yuan in scale and accounting for as much as 41% of GDP. However, most statistical studies in economics-related disciplines still employ traditional teaching methods, facing issues such as a disconnect between content and the digital economy, insufficient practical skill development, and incompatible teaching approaches, making it difficult to meet the talent cultivation demands under the backdrop of the digital economy. This paper proposes the realignment of teaching objectives, the construction of a teaching content system comprising "data-theory-software", "course-competition-certificate", and "course-theory-practice", and the adoption of a blended online and offline teaching model. The entire teaching process, including pre-class preparation, in-class interaction, and post-class project practice, was implemented through Rain Classroom. Experimental data showed a significant improvement in the experimental group's performance compared to the control group ($P < 0.05$).

Keywords: Digital economy, Online teaching, Rain Classroom, Software.

1. INTRODUCTION

Driven by emerging digital technologies such as cloud computing, 5G communication, and the metaverse, the digital economy is reshaping the global economic landscape at an unprecedented pace. According to the "2024 China Digital Economy Development Research Report" released by iResearch, China's digital economy exceeded 55 trillion yuan in 2024, accounting for 41% of GDP, and has become a core driver of economic growth. With the rapid development of the big data industry, the ways and means for people to obtain data have become increasingly diverse. The tools for data analysis and processing have also advanced significantly, and the demand for applied statistical professionals across various industries continues to rise. However, traditional statistics education still emphasizes the teaching of fundamental knowledge while neglecting students' computer operation practice and corresponding skill training. Therefore, the direction of statistics curriculum reform is to cultivate students' ability to analyze and solve

problems, fostering innovative and application-oriented talents to meet the rapid development of China's socio-economy.

2. RESEARCH STATUS

Currently, research on the reform of statistics teaching in economics-related majors under the backdrop of the digital economy has achieved certain results. Huo Jingwei and Yang Wenbo proposed introducing the "OBE teaching concept," combining classic teaching cases and adopting a blended online and offline teaching approach to integrate big data statistics into the curriculum. Li Yanan and others proposed that statistics education should be oriented toward cultivating practical abilities, including the clarification of teaching objectives, optimization of curricula, and the introduction of case-based teaching. The effectiveness of these reform measures was verified through specific teaching examples.

Sun Siyu proposed that by integrating online resources with offline teaching, the hybrid teaching

model can enhance student engagement and effectively improve teaching outcomes in statistics courses. Liu Yan proposed an innovative open-ended teaching approach based on flipped classrooms in statistics courses, promoting the reform of new open-ended teaching methods. However, there are still some issues in statistical education, such as the disconnect between teaching content and the digital economy, the lack of practical operational skills, and the incompatibility of teaching methods with the big data context. It is necessary to further explore strategies for reforming statistical education. Yu Yao proposed in "Reflections and Exploration on OBE-Guided AI-Enabled Teaching Models for Applied Statistics" that in the teaching of applied statistics, the SPSS software should be utilized with AI empowerment to innovate traditional teaching methods, stimulate personalized and autonomous learning among students, establish a results-oriented assessment mechanism, and focus on cultivating students' ability to solve practical data problems. Guan Guofeng proposed in "Research on the Path of Statistical Course Teaching Reform Empowered by New Productive Forces" that adopting situational and project-based teaching methods, establishing diverse practical platforms and a "dual-qualified" teaching team can enhance students' data processing and comprehensive practical abilities. Zhang Haiying proposed in "Research on Teaching Strategies for Cultivating Advanced Statistical Thinking Skills in the AI Era" that the key aspect of teaching reform lies in enhancing teachers' capabilities. By providing AI technology training, corporate practice, and thematic research, teachers can improve their AI integration skills. Updating the case database and teaching platforms further enhances teaching quality, enabling students to participate in real-world projects. Through practical engagement, they can experience statistical analysis thinking and enrich their hands-on experience.

3. PROBLEMS IN TRADITIONAL STATISTICS TEACHING

3.1 The Teaching Content Being Disconnected from the Digital Economy

At present, many statistics textbooks in universities have not been updated in a timely manner and still focus on imparting traditional knowledge. Most of them emphasize systematic explanations of theoretical knowledge, mainly

introducing theoretical content such as statistical surveys, statistical data organization, and statistical analysis. There is no systematic involvement of big data thinking, methods, software usage, etc. This can lead to a disconnect between course teaching and big data, neglect the cultivation of students' data thinking and innovation abilities, and the knowledge learned is difficult to meet practical work needs. After graduation, students cannot quickly adapt to the job requirements of digital economy enterprises.

3.2 The Teaching Content Lacking the Cultivation of Practical Operation Ability

The lack of practical hands-on operation in applied statistics courses results in students' relatively insufficient ability to apply basic principles and methods of statistics to solve practical problems. For example, in traditional classrooms, teachers introduce the calculation of average indicators, and the calculation of positional and numerical averages involves many formulas. Most of the class time is spent on reasoning and calculating formulas. However, in practical work, teachers should master the operation of descriptive statistical analysis using Excel, guide students to master practical methods such as "data analysis" and "descriptive statistics", and have a more intuitive understanding of statistical analysis tools in the digital economy; Traditional teaching usually relies on textbooks and teachers' lectures when teaching the analysis method of sampling inference, and the content updates are relatively slow. The teaching content focuses more on the basic concepts, theories, and formula derivation of sampling inference, such as population parameters, sample statistics, sampling errors, etc., which are relatively abstract. Teachers explain knowledge points in the classroom, while students passively accept them. Students' participation and initiative are limited to a certain extent, and there is a lack of digital resources and teaching software for learning.

3.3 Teaching Methods Being Not Compatible with Big Data Background

In terms of teaching methods, the "cramming" lecture style still dominates, neglecting the student-centered position, poor classroom interaction, low student learning enthusiasm, and difficulty in stimulating their active thinking and exploration desire. Although digital teaching resources such as MOOCs and online teaching platforms are

becoming increasingly abundant, some teachers are still unable to fully utilize these resources to carry out blended learning. The cases in case teaching are old, mostly centered on simple and idealized data cases, mostly derived from research or traditional industries many years ago, and not integrated into emerging fields and hot issues in the big data era, far from the complex real scene in the big data era. For example, when explaining regression analysis, the relationship between output and cost of traditional manufacturing is still taken as an example, and the correlation analysis between user growth and marketing investment of Internet enterprises is not involved; Project-based teaching is also difficult to implement, lacking real data project support, making it difficult to effectively cultivate students' practical and innovative abilities.

4. REFORM MEASURES FOR STATISTICS TEACHING IN ECONOMIC MAJORS AGAINST THE BACKGROUND OF DIGITAL ECONOMY

4.1 Repositioning Teaching Objectives

The rapid development of the digital economy has put forward higher requirements for the professional ethics of economic talents, which requires a deep integration of statistics and economics. Students are required to flexibly apply statistical analysis methods to practical problems in the economic field, such as predicting economic trends through time series analysis, exploring the relationship between economic variables through regression analysis, cultivating students' ability to abstract problems from economic phenomena and solve problems using statistical methods, and paying more attention to cultivating students' self-learning ability, communication and collaboration ability, and problem-solving ability, so that they can quickly adapt to the changes in industry development in the digital economy era and grow into talents that meet the needs of digital economy development.

4.2 Online and Offline Blended Teaching Model

4.2.1 Preparation Before Class

The teaching team needs to optimize the teaching courseware, screen and insert high-quality MOOC videos and online public teaching videos,

use Rain Classroom's "Intelligent Lesson Preparation Assistant" to insert teaching cases, introduce real-time cases, such as keeping up with the pace of the big data era and mining cases from current hot events and emerging industries; Taking the algorithm recommendation mechanism of short video platforms as an example, there is a must to analyze the practical application of data mining and machine learning algorithms, and enrich the content of teaching courseware. Teachers can create teaching videos for Excel and SPSS software, integrating interdisciplinary cases from economics, sociology, computer science, etc. Test questions synchronized with the videos need to be added to the courseware to real-time understand students' mastery.

4.2.2 Rain Classroom Teaching

The teaching team conducts lectures through the Rain Classroom plugin, pushing students to complete exercises based on key knowledge points during courseware playback, and requiring students to submit them on the Rain Classroom mobile app. The system will immediately display students' problem-solving progress, allowing teachers to monitor students' mastery of knowledge points at any time, even if adjusting class content and progress. During class, teachers can also use Rain Classroom tools such as random roll call, anonymous screen casting, bullet screen discussions, etc. to enhance students' interest and participation in learning.

4.2.3 After-school Programs

After class, each group is required to submit homework for the Rain Classroom project. The study group mainly uses Excel or SPSS software for data descriptive analysis, data organization and icon creation, parameter estimation practice, regression model demonstration, and statistical analysis report writing. In addition, students are assigned tasks based on real big data projects, such as analyzing user learning behavior for an online education platform, identifying key factors that affect user retention, and proposing improvement suggestions. Students participate in the entire process from data collection, cleaning, analysis to result presentation, understand statistical principles in practice, and enhance their comprehensive application abilities. After completing the project, students showcase their achievements, and teachers and students evaluate together to promote knowledge sharing and experience exchange.

4.2.4 Presentation of Teaching Achievements

The control group consisted of 58 students majoring in financial management who used the original teaching mode in the first semester of 2021-2022, while the experimental group consisted of 62 students majoring in financial management who used blended learning in the second semester of 2023-2024. The researchers used independent sample t-test (significance level of 0.05) to compare the course grades of two groups of students.

According to "Table 1", the average score of the control group is 67.2241 points, while the average

score of the experimental group is 84.4194 points. The performance of blended learning is significantly higher than that of traditional teaching mode, and the teaching performance is significantly improved.

Without assuming equal variance, the value of the t-test statistic is -8.68, and the value of P is less than 0.05, indicating a significant difference in scores between the two groups. Therefore, the use of online-offline blended learning has achieved good teaching results. ("Table 2")

Table 1. Comparison of mean and standard deviation between comparison table and experimental table

Group statistics					
	Class	N	Mean value	Standard deviation	Mean standard error
Grade	Control group	58.	67.2241.	11.13717.	1.46238.
	Experimental group	62.	84.4194.	10.51860.	1.33586.

Table 2. Table 2 Independent sample t-test table for control group and experimental group

Independent sample testing										
		Levin's test of homogeneity of variance		Mean value equivalence t-test						
Grade		F	Significance	t	Variance	Significance		Mean value difference	Standard error deviation	95% confidence interval for the difference
						Unilateral P	Bilateral P			Lower limit Upper limit
Grade	Assuming equal variance	0.004.	0.948.	-8.698.	118.	0.000.	0.000.	-17.195.	1.977.	-21.10. -13.28.
	Do not assume equal variance			-8.68.	116.21.	0.000.	0.000.	-17.195.	1.981.	-21.12. -13.27.

4.3 Teaching Content Reform

4.3.1 The "Data-Theory-Software" Model

The statistics course requires a reasonable allocation of theoretical lectures and software learning hours, increasing the proportion of practical teaching hours to about 50%. The experimental course content is based on teaching objectives, mainly covering data organization, chart making, descriptive analysis, parameter estimation, hypothesis testing, regression analysis, and analysis report writing, totaling 8 modules. The system trains students in data processing and analysis skills in the big data environment. The teaching team produces teaching videos using Excel and SPSS software, uploads them to Rain Classroom, and forms a practical teaching database. Adopting a

blended learning approach can effectively solve the problems of limited teaching hours and individual operational differences, making it easy for students to review through Rain Classroom at any time.

4.3.2 "Course-Competition-Certificate" Model

The "Zhengda Cup College Student Market Research and Analysis Competition" and the "Challenge Cup College Student Extracurricular Science and Technology Works Competition" are highly recognized and participated in by colleges and universities. However, the high threshold for current competitions has deterred many students. On the other hand, there is a lack of equally recognized alternative practice platforms on campus, resulting in a single channel for student

practice. Teachers can use competition projects to initiate research work, collect data, analyze topics, conduct sampling and data analysis in the process of participating, and to some extent apply theoretical knowledge to practice. This not only enhances students' interest in participation, but also helps them improve their thinking and application abilities in statistical analysis.

4.3.3 "Course-Theory-Practice" Model

The statistics course is based on the talent cultivation plan and incorporates the concept of collaborative education between schools and enterprises. It enables students to achieve deep integration of theory and practice in real-world scenarios, while jointly establishing practical training bases with diverse types of enterprises such as e-commerce, finance, and internet sectors. Students can participate in real corporate projects during the semester, gaining exposure to cutting-edge industry technologies and authentic business scenarios, such as forecasting market trends using sales data or optimizing product recommendation algorithms through user behavior analytics. Dual-track guidance involves both corporate mentors and school teachers. Corporate mentors deliver lectures and guide practical training, imparting industry hands-on experience and business logic. School teachers ensure the accuracy of theoretical application, providing full-process follow-up from project planning and data collection to the preparation of analytical reports. After the practice, assessments are conducted through diversified methods such as corporate evaluations and project outcome presentations, effectively enhancing students' ability to solve practical problems and achieving seamless alignment between teaching and industry requirements. Additionally, schools and enterprises can collaborate on research projects, with teachers leading students in participation to facilitate the transformation of research outcomes, thereby enhancing students' scientific literacy and innovative capabilities.

5. CONCLUSION

The rapid development of the digital economy has brought new opportunities and challenges to the reform of statistics education. By updating teaching concepts, restructuring the curriculum system, and innovating teaching models through a series of reform measures, the quality of statistics education can be effectively enhanced, cultivating high-caliber statistics talents who meet the demands of

the digital economy. In the future reform practices, there is a must to continue to monitor the developments in the digital economy, continuously adjust and refine teaching reform plans, promote the deep integration of statistics education with the digital economy, and provide solid talent support and intellectual backing for the growth of the digital economy.

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