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Research on the Construction and Practice of an AI-Enhanced Blended Teaching Model for Econometrics

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Abstract

Artificial intelligence (AI) has emerged as a key driver of curriculum reform in higher education. For econometrics—a discipline that emphasizes both theoretical rigor and methodological application—the integration of AI into blended teaching models is a pressing issue in contemporary pedagogy. This study investigates the development of an AI-enhanced instructional framework for econometrics, focusing on students majoring in International Economics and Trade at Sichuan International Studies University. By incorporating tools such as ChatGPT and machine learning into a blended learning environment that combines online platforms with in-person instruction, the course adopts a "Technology Integration–Project-Based Learning–Practice Orientation" approach. In the practical process, the course focuses on strengthening students' comprehensive abilities in data processing, empirical modeling, and economic problem analysis, promoting their transition from theoretical learning to research and practice. Research has shown that AI empowerment can effectively enhance the teaching efficiency of econometrics courses and improve students' practical application skills, providing a viable pathway for curriculum reform.

Keywords

Artificial Intelligence(AI), Econometrics, Blended Learning, Teaching Reform, Empirical Practice

1. Introduction

In recent years, with the steady advancement of China's New Liberal Arts initiative, curriculum reform in humanities and social sciences has entered a new phase characterized by integrated innovation. Emphasizing a balance between theoretical literacy and practical competence, this reform advocates the deep integration of technological empowerment with course content. Within

the discipline of economics, econometrics—serving as a methodological bridge between statistics, economic theory, and empirical analysis—has attracted growing attention in educational reform discourse. Scholars increasingly argue that econometrics instruction should break free from its traditional emphasis on theory over practice, instead prioritizing empirical skill development and pedagogical innovation (Bai & Chen, 2012; Li & Zhang, 2013; Li, 2019). A variety of reform strategies have since emerged, including case-based teaching, task-driven instruction, and interactive experimentation, all contributing to a broader shift toward application-oriented talent cultivation (Jin, 2016; Ye et al., 2018; Zeng, 2020).

Meanwhile, the rapid development of artificial intelligence and big data technologies has injected new vitality into econometrics education. Under the influence of paradigms such as machine learning and transfer learning, traditional course content, teaching methods, and assessment frameworks are undergoing fundamental transformation. A growing body of research suggests that integrating AI tools into instruction not only enhances students' capacity for handling high-dimensional data, but also fosters deeper problem-solving skills and greater technological fluency (Wang, 2021; Zheng, 2024; Cheng et al., 2024). Hong and Wang (2024) further argue that large language models such as ChatGPT are reshaping the research paradigm in economics, offering new opportunities for innovation in econometrics pedagogy. Nevertheless, these technologies still present challenges in areas such as interpretability and causal inference, which necessitate alignment with economic theory to ensure accurate content renewal and comprehensive skills development.

Against this dual backdrop of digital transformation and New Liberal Arts reform, the integration of AI into econometrics curriculum design has emerged as a key focus in teaching research. This study, drawing on the practical context of Sichuan International Studies University, aims to construct and implement an AI-augmented instructional model for econometrics. The objective is to provide a feasible and adaptable reference for advancing curriculum reform in related fields and responding effectively to the evolving demands of talent cultivation in the era of digital economics.

2. Challenges in Implementing AI-Enhanced Blended Teaching in Econometrics

2.1 Insufficient Integration of AI Technology with Course Content

Although AI technology holds great promise in educational applications, its deep integration with the content of econometrics courses remains a significant challenge. Econometrics involves complex mathematical modeling and advanced data analysis, which current AI-powered teaching tools may not fully accommodate. For example, intelligent question banks may struggle to generate exercises that meet the cognitive rigor of high-level econometric thinking, and AI algorithms often fall short in evaluating students' logical consistency in constructing economic models. Moreover,

many instructors lack adequate technical training and institutional support when implementing AI-enhanced pedagogical models, leading to superficial adoption of AI tools that fails to substantively improve instructional quality. Therefore, how to meaningfully align AI technologies with the core content of econometrics remains an urgent issue.

2.2 Balancing Student Autonomy and Dependence on AI Technologies

In AI-supported blended learning environments, students benefit from personalized learning pathways, intelligent tutoring, and real-time feedback. However, these advantages may inadvertently foster overreliance on technological support, thereby hindering the development of self-directed learning competencies. For instance, students may depend too heavily on AI-generated answers or solutions, lacking motivation for independent inquiry or critical reflection. Others may focus narrowly on AI systems' instant feedback, at the expense of cultivating systematic knowledge and long-term conceptual understanding. Furthermore, students unfamiliar with AI interfaces or skeptical of their reliability may experience reduced learning efficacy. Hence, striking a balance between leveraging AI for efficiency and fostering student autonomy and critical thinking is a core pedagogical challenge in AI-enhanced instruction.

2.3 Challenges in Redefining the Teacher's Role and Enhancing Professional Competence

The AI-enhanced blended teaching model requires educators to transition from being traditional knowledge transmitters to learning facilitators and curriculum designers—a shift that imposes higher demands on their professional capabilities. First, instructors must acquire foundational knowledge of AI principles and applications to effectively integrate these tools into their teaching practice. Yet, many educators lack technical backgrounds and may struggle to adapt quickly to this new paradigm. Second, teachers must be able to incorporate ideological and value-based education ("curriculum ideology") into AI-enhanced course design, a task that requires both pedagogical creativity and socio-political awareness. Lastly, instructors need strong data literacy skills to interpret AI-generated learning analytics and make evidence-based adjustments to instructional strategies. Facilitating this professional transition is essential for the successful implementation of AI-empowered teaching models in higher education.

3. Construction of an AI-Enhanced Blended Teaching Model for Econometrics

The construction of an AI-enhanced blended teaching model for econometrics aims to promote deep integration between emerging technologies and disciplinary knowledge, breaking through the limitations of traditional instructional approaches and enhancing students' data literacy, modeling skills, and comprehensive application abilities. Supported by artificial intelligence, this model advances students' practical competencies and research potential through three key components: restructuring course content, innovating teaching methods, and strengthening practical training. The

detailed structure of the model is illustrated in Figure 1.

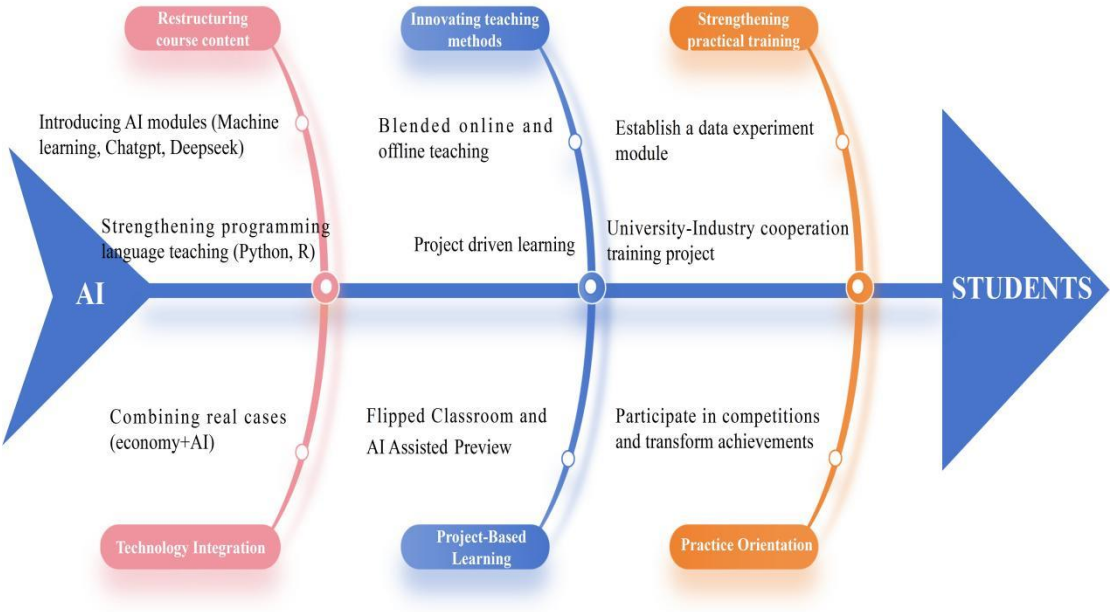

Figure 1. Construction Framework of an AI-Enhanced Blended Teaching Model for Econometrics

3.1 Restructuring Course Content: Integrating Intelligent Technologies with Disciplinary Knowledge

Integrating AI technologies into the teaching of econometrics has become a key direction in contemporary curriculum reform. First, it is essential to incorporate AI-related modules—such as machine learning models, natural language processing, and data mining—into the curriculum to strengthen students' abilities in data processing and model construction in the context of big data. For instance, alongside traditional topics like OLS regression and cointegration testing, the course should introduce modern algorithms such as random forests and Lasso regression to broaden students' methodological horizons. Second, training in mainstream programming languages such as Python and R should be emphasized, enabling students to proficiently apply AI libraries such as Scikit-learn and XGBoost for tasks including data cleaning, modeling, and prediction. This technical integration not only enhances the practical relevance of the course but also aligns it more closely with current industry and research trends. In particular, AI algorithms can compensate for the limitations of traditional econometric models in areas like economic forecasting and market analysis by improving model accuracy and explanatory power. Furthermore, the course should be grounded in real-world economic cases, such as "Predicting Consumer Spending Behavior Using Machine Learning" or "Analyzing China's Export Data with ChatGPT," to help students understand

how AI tools are applied in economic decision-making. By deeply integrating disciplinary knowledge with AI technologies, students are empowered to construct economically interpretable models in real-world contexts, thereby enhancing their cross-disciplinary application skills.

3.2 Innovating Teaching Methods: Enhancing Interactivity and Practice Orientation

To enhance instructional effectiveness, the blended teaching model combines online platforms with face-to-face classroom activities. In the online component, platforms such as Xuexitong and Rain Classroom are used to release theoretical content, programming tutorials, and AI model demonstrations in advance, enabling students to engage in knowledge preheating and personalized learning. The in-person sessions focus on problem-based learning and case discussions, where instructors guide students through economic data analysis, model construction, and the use of AI tools for empirical modeling and data visualization. Project-based learning serves as a core instructional strategy in this model. The course is designed around practical, economically relevant project topics such as "Using AI Models to Predict Stock Market Volatility" or "An Empirical Study on the Impact of Macroeconomic Variables on Household Consumption." Students work in groups to complete the full analytical process, including data collection, model specification, selection of appropriate AI tools, and interpretation of results. This approach not only develops students' teamwork and communication skills but also deepens their understanding of how AI techniques can be integrated with econometric modeling. In addition, a flipped classroom mechanism encourages students to use AI assistants such as ChatGPT during pre-class preparation for previewing concepts and self-testing. Class time is then dedicated to problem-solving, Q&A sessions, and hands-on case analysis. This model significantly increases student engagement and transitions instruction from "knowledge delivery" to "skill development" and "cognitive cultivation."

3.3 Strengthening Practical Training: Enhancing Applied Competence

A critical component of AI-enhanced courses is the development of a structured and robust practical training system. First, a semester-long data lab module should be established, in which students use AI tools to conduct modeling and analysis on real-world economic datasets, such as those from the National Bureau of Statistics or the World Bank. This module should encompass four key stages: data preprocessing, model construction, result validation, and economic interpretation—forming a complete learning cycle that links tools, methods, and real-world economic problems. Second, the course can be integrated with enterprise-based projects through collaborations with fintech firms, data analytics companies, or policy research institutions. These "AI + Economic Analysis" projects are designed to simulate actual business scenarios and enhance students' ability to address practical challenges. Example topics include predicting customer churn rates for banks or forecasting regional GDP growth. Such tasks encourage students to apply econometric models and AI

algorithms in complex, dynamic environments. In addition, students should be encouraged to participate in AI modeling competitions and academic writing initiatives, both within and beyond the university. These opportunities help students develop scientific communication skills and improve their ability to present technical results. The accumulation of competition experience and project-based outcomes not only reinforces core competencies but also provides a portfolio of demonstrable achievements that supports future academic advancement and career development.

4. Implementation and Impact of the Teaching Model Reform

To evaluate the effectiveness of the AI-enhanced blended teaching model in econometrics, this study conducted a teaching reform experiment with undergraduate students majoring in Finance (Undergraduate students of 2023) at Sichuan International Studies University. The experimental group adopted an innovative model combining AI tools, project-based learning, and blended instruction, while the control group followed a traditional lecture-based approach. The results demonstrated that students in the experimental group significantly outperformed those in the control group in terms of average course grades, project quality, and classroom engagement. Specifically, the average score of the experimental group was 5.5 points higher than that of the control group, and over 80% of students in the experimental group effectively utilized AI tools such as Python and ChatGPT throughout the course. A post-course survey revealed that more than 90% of students in the experimental group expressed high satisfaction with improvements in learning interest, practical skill development, and the effectiveness of AI integration. The model also notably enhanced students' ability to construct models and address real-world economic problems. However, it simultaneously posed greater demands on instructional design and technical infrastructure. Overall, the AI-enhanced blended teaching model significantly improved teaching effectiveness and offered a viable pathway and practical reference for the transformation of econometrics education under the New Liberal Arts framework.

5. Conclusion and Future Outlook

The AI-enhanced blended teaching model for econometrics has demonstrated significant advantages in both theoretical design and practical implementation. By integrating artificial intelligence technologies with economic modeling skills, the course has successfully overcome the longstanding challenges of outdated content, rigid instructional methods, and insufficient practical engagement inherent in traditional teaching approaches. Empirical findings indicate that this model effectively improves students' data analysis capabilities, learning motivation, and classroom participation, thereby contributing to the development of comprehensive academic competencies.

This study not only offers a practical case for the reform of econometrics education but also provides a replicable framework for exploring the pedagogical application of AI technologies in economics-related courses. Moving forward, further course optimization should focus on strengthening training in model interpretability, fostering students' critical and reflective use of AI tools, and promoting the construction of integrated resource platforms and interdisciplinary collaboration. These efforts will be essential for expanding the depth and breadth of the model's application and for supporting the cultivation of high-quality, interdisciplinary economic talent in the digital era.

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