Novelty Journals

ISSN 2394-9686

International Journal of Novel Research in Education and Learning
Vol. 13, Issue 4, pp: (40-45), Month: July - August 2026, Available at: www.noveltyjournals.com

Research and Practice on the Digital Intelligent Transformation of Western Economics Course Empowered by Artificial Intelligence

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DOI: https://doi.org/10.5281/zenodo.21803584

Published Date: 05-August-2026

Abstract: **Against the backdrop of educational digitalization, generative AI and intelligent teaching platforms provide support for the teaching reform of interdisciplinary courses. Western Economics, a core basic course for Financial Mathematics and Applied Statistics majors, is plagued by homogeneous teaching, disconnection between mathematical logic and economic theories, and a single evaluation system. Taking 99 students (47 majoring in Financial Mathematics and 52 majoring in Applied Statistics) of the Class of 2024 in our university as research objects, this paper carries out a one-year complete teaching practice integrating artificial intelligence with Xuexitong Platform. A five-dimensional transformation framework covering hierarchical curriculum, dual-driven classrooms, personalized tutoring, multi-dimensional evaluation and digital intelligent teachers is constructed, and a closed-loop online-offline teaching process is designed. The teaching effects are tested based on full-sample platform data and questionnaire feedback. Practice proves that this model realizes targeted education for different majors and significantly improves students' quantitative modeling and economic research capabilities, offering a replicable paradigm for the digital intelligent reform of economics courses for similar mathematics-based majors.**

Keywords: **Artificial Intelligence; Western Economics; Digital Intelligent Transformation; Smart Classroom; Whole-process Evaluation.**

I. INTRODUCTION

1.1 Research Background

The report to the 20th National Congress of the Communist Party of China proposed to advance the digitalization of education. The Action Plan for "Artificial Intelligence + Education" requires digital intelligent technologies to be deeply integrated into classroom teaching. As mathematics-interdisciplinary majors, Financial Mathematics and Applied Statistics cultivate talents with both mathematical modeling ability and macroeconomic research capacity. Western Economics serves as a prerequisite basic course connecting mathematical tools with finance and statistics industries. The course contains a large number of equilibrium and macro mathematical models, which are highly compatible with students' mathematical foundations. However, the traditional offline unified teaching fails to distinguish the training objectives of the two majors, featuring outdated cases, insufficient practical sessions and an examination-centered assessment method that cannot cultivate compound talents.

As an integrated mainstream intelligent teaching platform in China, Xuexitong integrates learning status collection, hierarchical resources, AI teaching assistants and full-process data storage. It can link generative AI to automatically produce quantitative economic cases and decompose mathematical models, fully recording students' online learning trajectories. Most existing studies on AI-enabled economics teaching focus on general economics and higher vocational finance majors, and few conduct full-sample, non-controlled teaching practices targeting Financial Mathematics and Applied Statistics based on Xuexitong Platform. This paper takes 99 students as a complete practice group and carries out full-course digital intelligent teaching reform by combining Xuexitong with artificial intelligence.

1.2 Research Significance

Theoretically, existing research lacks a complete digital intelligent framework for Western Economics based on Xuexitong for mathematics-interdisciplinary majors. Combined with differentiated learning conditions of financial quantification and macro statistics majors, this paper constructs an integrated teaching logic of "Economics + Mathematical Modeling + AI Tools", enriching the digitalization theories of interdisciplinary teaching under the New Engineering and New Liberal Arts background.

Practically, the entire teaching plan takes Xuexitong as the sole online carrier without setting control groups, equipped with major-specific resources, online simulation tasks and automatic evaluation standards, which can be directly implemented by colleges and universities. Meanwhile, the platform's permission function simplifies the management of students' data security, balancing operability and standardization of the reform.

1.3 Domestic and Foreign Research Review

Overseas studies adopt adaptive platforms and large language models for economic simulation teaching, yet their cases and institutions are based on Western markets, which cannot adapt to China's localized teaching and curriculum ideological and political education requirements. Domestic relevant research falls into four categories: first, the AI reform of higher vocational finance courses, which focuses on practical skills and is not applicable to mathematical modeling teaching; second, special research on Econometrics and Macroeconomics, failing to differentiate the demands of finance and statistics majors without combining full-process data collection of Xuexitong; third, research on smart classrooms of engineering and physical education, whose disciplinary attributes differ greatly and cannot be directly reused; fourth, industry-education integration research on energy and accounting majors, lacking the design of online hierarchical tutoring. Overall, existing studies lack full-cycle teaching research centered on Xuexitong covering the two types of mathematics majors.

1.4 Research Objects and Methods

1.4.1 Research Objects

No control groups are set in this practice, and all students adopt the "Xuexitong + Artificial Intelligence" teaching model with a total sample of 99 students: 47 students majoring in Financial Mathematics of the Class of 2024, focusing on quantitative modeling of financial assets and platform equilibrium; 52 students majoring in Applied Statistics of the Class of 2024, focusing on statistical analysis of macro indicators and industry panel data. All links including preview, task submission, classroom interaction and online assessment are completed on Xuexitong, with all teaching data automatically stored by the platform.

1.4.2 Research Methods

(1) Literature Research Method: Sort out relevant literature on AI-enabled education and intelligent teaching of Xuexitong, and extract general frameworks for curriculum reconstruction and process evaluation.

(2) Action Research Method: Iterate online resources, simulation tasks and evaluation standards for 99 students within one academic year.

(3) Full-sample Data Analysis Method: Extract quantitative data including preview records, assignments, modeling reports and in-class quizzes from the backend of Xuexitong for statistical analysis.

(4) Questionnaire and Interview Method: Distribute anonymous online questionnaires to all students after the course, and conduct stratified interviews to collect subjective feedback.

II. INTERNAL MECHANISM AND MAJOR ADAPTATION VALUE OF INTEGRATING AI WITH XUEXITONG

2.1 Underlying Logic of Collaborative Teaching

Supported by Xuexitong, artificial intelligence and machine learning technologies, a closed-loop system of "Data Collection--Learning Profile--Major-specific Resource Push--Human-Machine Inquiry--Teaching Optimization" is built with three functional modules operating in coordination. As a digital intelligent base, Xuexitong uniformly stores course courseware, major-specific resource libraries, online assignments and discussion areas, automatically collecting all learning

traces of the 99 students to provide objective quantitative data for learning diagnosis and whole-process evaluation. The AI linkage module embeds intelligent Q&A functions and connects external generative AI. It can automatically generate differentiated quantitative datasets and step-by-step video explanations of mathematical models according to students' major labels, with all teaching materials archived in the platform resource library. The machine learning learning analysis module mines multi-dimensional data such as video viewing duration, error types and task completion quality to automatically divide students into two groups: students with weak economic theories and students with insufficient modeling ability, and match hierarchical learning resources accordingly. On the basis of this closed loop, a ternary collaborative teaching relationship is reconstructed: Xuexitong takes charge of standardized management of data, tasks and scores; artificial intelligence undertakes repetitive work including case generation and basic Q&A; teachers focus on the design of major-specific simulation tasks and guidance of economic critical thinking; students carry out quantitative economic inquiry independently with digital resources provided by the platform and AI.

2.2 Adaptation Value for the Two Types of Majors

Firstly, it solves the problem of homogeneous teaching. Xuexitong stores exclusive resources for finance and statistics in separate folders, and students can automatically match learning materials after logging in. Secondly, it realizes traceable evaluation: the platform completely stores the whole process data of modeling and seminars to reduce teachers' subjective scoring bias. Thirdly, it extends practical scenarios, allowing students to access AI-generated economic data anytime and anywhere to complete online-offline quantitative analysis. Fourth, it realizes lightweight risk control. The platform's account classification and data encryption functions simplify privacy protection, and teachers can review all AI teaching materials in advance.

III. CORE DILEMMAS OF TRADITIONAL TEACHING

Combined with the initial placement test and online interviews of 99 students on Xuexitong, five prominent problems are summarized:

(1) Undifferentiated curriculum: Uniform textbooks and exercises fail to provide pricing simulation materials for finance students and macro time-series datasets for statistics students, making it impossible to give full play to students' mathematical strengths.

(2) Delayed learning diagnosis: Only offline paper assignments are adopted without online pre-class preview diagnosis, so teachers cannot grasp common weaknesses of the class in advance.

(3) Fragmented application of AI tools: AI is only used to generate courseware sporadically, failing to connect with the task and evaluation system of Xuexitong, lacking online collaborative modeling scenarios.

(4) Unbalanced evaluation system: Final written examinations account for 70% of the total score without online process data support, making it difficult to measure high-level abilities such as quantitative modeling.

(5) Insufficient teachers' integrated competence: Teachers are proficient in offline teaching but unable to build major-specific resource libraries on Xuexitong, lacking channels for interdisciplinary online teaching and research.

IV. IMPLEMENTATION PATHS OF DIGITAL INTELLIGENT TRANSFORMATION INTEGRATING AI WITH XUEXITONG

4.1 Reconstruct Three-tier Online Curriculum System Based on Xuexitong

Three-level resource catalogs are built on the platform. Materials generated by AI are reviewed by teachers before storage, and students can automatically access resource packages corresponding to their majors.

(1) General Basic Layer (for all students): Upload core courseware of microeconomics and macroeconomics. AI generates model animation and sets online knowledge breakthrough preview tasks. The system summarizes common errors for classroom targeted explanation.

(2) General Quantitative Layer (compulsory for all students): Set up a special column of economic quantification. AI generates standardized datasets based on data from the National Bureau of Statistics and stock exchanges, matched with online basic training including data cleaning and supply-demand regression.

(3) Major-specific Expansion Layer (automatically distributed by the platform)

- Financial Mathematics (47 students): Datasets of e-commerce and securities equilibrium pricing, online tasks of monopoly and asset quantitative modeling.
- Applied Statistics (52 students): Ten-year panel data of CPI and GDP, online tasks of fiscal policy time-series regression analysis.

Meanwhile, the AI-generated curriculum knowledge graph is uploaded to Xuexitong, linked to corresponding exercises and datasets. The platform automatically updates economic policies and industry data every week.

4.2 Dual-driven Classroom Paradigm of "Xuexitong Online Tasks + AI Quantitative Simulation"

Preview, seminars and report submission are completed online via Xuexitong, while group modeling is carried out in offline smart classrooms with real-time online data interaction.

Hardware and software collaborative architecture: The online carrier is the complete Xuexitong curriculum portal; auxiliary AI generates datasets and visual materials; offline tablets allow students to log in the platform to access resources.

Major-specific classroom tasks: Finance groups conduct optimal pricing simulation based on trading data from the platform; statistics groups access macro panel data to simulate policy impacts. The 120-minute class is divided into three parts: 80 minutes of targeted intensive teaching, 25 minutes of major-specific online-offline modeling, and 15 minutes of online achievement evaluation and critical thinking summary. All seminar records are permanently stored on the platform.

4.3 Full-process Hierarchical Personal Tutoring Driven by Xuexitong

Pre-class: Online Adaptive Preview Diagnosis

Students complete major-specific breakthrough quizzes. The platform AI generates class learning reports and automatically pushes micro-courses and exercises to accounts of underperforming students.

In-class: Real-time Intervention via In-class Quizzes

Online exercises are released during class. The system calculates accuracy in real time and pushes AI decomposition micro-courses for common difficult points, with teachers conducting offline simulation demonstrations synchronously.

After-class: Automatically Hierarchical Tasks Pushed by the Platform

Based on in-class data, students are divided into three levels: basic level for model consolidation exercises; improvement level for standard major modeling reports; expansion level for independent frontier quantitative research. All reports are submitted online. The platform provides 24-hour AI Q&A and summarizes frequent questions for teachers to explain in class.

4.4 Multi-dimensional Comprehensive Evaluation Based on Full Platform Data

The multi-dimensional evaluation system of "40% Process Evaluation + 60% Summative Evaluation" is adopted, with all data automatically calculated by Xuexitong.

(1) Process Evaluation (40%): Preview breakthrough (10%), in-class quizzes and seminars (10%), after-class hierarchical tasks (10%), online group collaboration (10%).

(2) Summative Evaluation (60%): Offline closed-book examination.

A unified three-dimensional scoring rubric is adopted: 40% for adaptability of economic theories, 30% for standardized application of AI and mathematical tools, 30% for collaboration and innovative critical thinking. The platform automatically calculates objective indicators while teachers judge subjective innovative dimensions. A learning dashboard is generated for each student, and teachers export class data every two weeks to optimize teaching resources.

4.5 Training System for Digital Intelligent Teachers

(1) Hierarchical Platform Training: General training for all teachers on Xuexitong operation and AI material production; advanced workshops focusing on the design of online courses and simulation tasks for different majors.

(2) Interdisciplinary Online Teaching and Research: Set up a special teaching and research zone on Xuexitong for teachers of economics, finance and statistics to prepare lessons together and jointly develop online cases and datasets.

(3) Industry Practice Mechanism: Invite practitioners from quantitative finance and statistical institutions to transform real projects into online simulation tasks on the platform.

V. FULL-SAMPLE CLOSED-LOOP TEACHING AND EFFECT ANALYSIS

5.1 Complete Online-offline Teaching Process

(1) Pre-class Online Stage: Students log into Xuexitong to complete major-specific preview quizzes. AI generates learning profiles, and teachers determine key and difficult points according to platform data. Students submit questions in the AI Q&A zone in advance.

(2) In-class Linkage (120 mins): Teachers explain common difficult points based on preview data; students log into the platform in groups to access AI datasets for quantitative modeling and upload phased results to the seminar zone; all groups evaluate achievements online, and teachers guide students to distinguish Western theories from China's macro governance logic combined with local economic cases.

(3) After-class Online Stage: The platform automatically pushes hierarchical modeling tasks. Students submit reports online, and AI preliminarily checks data logic with targeted comments from teachers. The platform summarizes frequent questions for unified explanation in the next day, and all learning records are incorporated into evaluation files.

5.2 Quantitative Effect Analysis

Based on full-sample backend data and valid questionnaires of 99 students:

The average comprehensive score of all students is 87.4 points, with a pass rate of 97% and 45 excellent students (45.45%). The average score of final modeling reports is 90.2, and the average score of online open assessments is 88.5.

Major-specific data: The average score of 47 Financial Mathematics students is 88.1, with 23 excellent students (48.94%); the average score of 52 Applied Statistics students is 86.8, with 22 excellent students (42.31%). Scores of quantitative tasks are significantly higher than those of basic theoretical exercises.

Competition Performance: 48 out of 99 students participate in economics, statistics and finance competitions, accounting for 48.48%, among whom 22 win awards at university level and above.

Subjective Feedback: The overall satisfaction rate from 99 questionnaires reaches 94.04%. Students recognize that major-specific online resources and hierarchical tasks lower learning barriers, and virtual quantitative simulation makes abstract models easier to understand. Interviews show that finance students are well adapted to pricing tasks while statistics students benefit from macro time-series analysis training, and they propose to expand datasets of segmented industries as an optimization suggestion.

VI. CONCLUSION AND RESEARCH PROSPECTS

This paper takes 99 students (47 Financial Mathematics, 52 Applied Statistics) of the Class of 2024 as complete research samples, and completes one-year digital intelligent teaching of Western Economics by integrating artificial intelligence with Xuexitong. Three core conclusions are drawn:

First, the teaching reform based on Xuexitong and artificial intelligence is a systematic innovation covering curriculum content, classroom mode, tutoring mechanism, evaluation and teacher development. Relying on the platform's major-specific resources and full-process data advantages, the training objectives of financial quantification and macro statistics can be matched, giving full play to students' mathematical strengths and making up for their deficiencies in economic critical thinking, so as to realize targeted education for large classes with different majors.

Second, the dual-driven classroom of "online hierarchical tasks + offline AI quantitative simulation" adapts to the learning characteristics of mathematics-interdisciplinary majors. The whole-process multi-dimensional evaluation on the platform reverses the traditional assessment orientation of "valuing memorization over practice". The 99 students achieve satisfactory comprehensive scores, modeling ability and classroom satisfaction, and their enthusiasm for discipline competitions is significantly improved. This model can be replicated and promoted in similar universities.

Third, the built-in authority and data encryption functions of Xuexitong can lightweightly solve risks including student privacy leakage and AI algorithm bias. Supporting long-term mechanisms of online teaching research and resource iteration can balance technology empowerment and the independent thinking and value-oriented education of students.

This practice only covers one grade within one academic year with a short research cycle, and general generative AI rather than exclusive teaching assistants for economics are adopted. Future research can expand samples of multiple grades for long-term tracking, and cooperate with technology enterprises to develop built-in AI modules adapted to finance and statistics. In the long run, two research directions can be further explored: first, explore the integration path of curriculum ideological and political education and economic cases automatically matched by Xuexitong AI; second, build differentiated online digital intelligent teaching schemes by distinguishing the learning characteristics of undergraduate and vocational undergraduate mathematics majors.

ACKNOWLEDGMENTS

This work was supported by the 2023 Construction Project of Teaching Quality and Teaching Reform Engineering for Undergraduate Universities in Guangdong Province, "Research and Practice on the Smart Classroom Teaching Model of Western Economics Course Under the Background of New Liberal Arts" (Yue Jiaogao Han〔2024〕No.9: 1054).

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