Higher Education and Practice Vol. 2 No. 10, 2025

Curriculum Reform and Innovation of E-Commerce Programs in Higher Education under the Empowerment of Artificial Intelligence

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Abstract: Guided by smart education, technologies such as artificial intelligence and big data are increasingly integrated into university teaching, opening up new directions for instructional reform. As a key field for cultivating interdisciplinary talent, the e-commerce major must address issues such as fragmented curricula, homogeneous teaching formats, weak practical training, and outdated evaluation practices. This paper proposes a "teacher—student—machine" collaborative framework that utilizes intelligent tools, restructures teaching content, builds ubiquitous smart learning environments, and strengthens evaluation mechanisms. The resulting "data-driven—adaptive—competence—oriented" model offers a feasible pathway for promoting the smart transformation and talent cultivation innovation in e-commerce education.

Keywords: Artificial Intelligence; AI Empowerment; Teaching Reform; Higher Education; E-Commerce

1. Introduction

In January 2025, the Education Modernization Plan (2024 - 2025) established national goals to develop AI - driven educational models and promote the in - depth integration of intelligent technologies with teaching. In this context, the e - commerce major must restructure its curriculum and update instructional practices to meet the requirements of intelligent education.

The increasing utilization of artificial intelligence, big data, and virtual simulation in higher education offers the technological basis for smart course innovation. Guided by a student - centered approach, smart courses aim at core competencies for the digital business environment and utilize intelligent platforms, case - based simulations, and project - driven learning to enhance both conceptual comprehension and practical ability.

Ubiquitous smart learning environments, such as virtual e - commerce operation systems and intelligent marketing labs, further enhance immersion, interactivity, and experiential learning. These developments support continuous instructional reform, align with industry digitalization, and improve the quality and efficiency of talent cultivation.

2. Challenges in Traditional E-Commerce Instruction

2.1 Fragmented Curriculum and Insufficient Cross-Course Integration

The current curriculum system of e - commerce programs is generally characterized by a loose structural organization and insufficient coordination among courses. The instructional content of each course is developed independently, leading to dispersed knowledge points and the lack of a progressive design that links "foundational learning—applied learning—extended learning." For example, both Online Marketing and Business Data Analysis cover the knowledge point of "user profiling," but this content is presented repetitively without forming a coherent logic that connects data collection, model construction, and marketing application. As a result, students lack clear learning pathways and have limited ability to transfer knowledge across modules.

In addition, traditional teaching practices generally lack systematic modeling and relational design of course content. A curriculum structure centered on a knowledge graph has not been established yet, resulting in weak connections among knowledge points and the emergence of "isolated content islands." Moreover, the absence of competency tagging and recommended learning pathways makes it

difficult for students to build a systematic understanding and gain deeper conceptual insights throughout the learning process. These issues impede the development of an intelligent curriculum ecosystem and reduce overall learning efficiency [1].

2.2 Homogeneous Teaching Methods and Limited Motivation for Deep Learning

The instructional approach adopted in e-commerce courses still predominantly relies on traditional lecturing and case-based commentary. This results in a passive learning pace for students, low levels of classroom engagement, and difficulty in stimulating their intrinsic learning motivation [2].

Although some instructors have attempted to integrate online and offline resources, most implementations remain at the basic level of "PPT plus video," lacking in-depth instructional support based on AI-driven recommendation algorithms or adaptive learning pathways. Classroom teaching has not yet achieved effective human–technology synergy, nor has it established an intelligent classroom ecosystem that integrates teachers, students, and learning systems into a cohesive triad.

Faced with a new generation of students with a high degree of digital literacy, such single - mode, linear instructional methods are not only insufficient for cultivating genuine learning interest but also inadequate for developing critical thinking skills and the ability to transfer knowledge across contexts.

2.3 Virtualized Practical Training and Misalignment between Skills and Industry Needs

The applied nature of the e - commerce discipline demands that instructional effectiveness be closely supported by immersive engagement in authentic business environments. However, most universities currently face two major drawbacks. First, there is a lack of stable university–enterprise collaboration mechanisms and consistent channels for enterprise participation. As a result, practical training remains largely at superficial levels, such as case reviews and process walkthroughs. Second, the allocation of digital training resources is insufficient: there is no operational simulation platform connected to real corporate data, nor are there practical tools for user behavior tracking, conversion funnel analysis, and related operational analytics. Consequently, students are unable to complete the full cycle of commercial practice, from product selection and traffic acquisition to conversion and customer retention [3].

This practice model, characterized by strong theoretical knowledge but insufficient hands - on experience, leads to a structural mismatch between students' professional skills and workplace requirements, ultimately limiting their competitiveness in the job market.

3. Building a Teacher–Student–Machine Collaborative Community to Enhance Synergistic Learning

3.1 Outcome-Oriented and Learner-Centered Personalized Instruction

E-commerce curriculum design adheres to a learner-centered and outcome-oriented approach, establishing instructional objectives around the development of core competencies.

By constructing a three-dimensional "knowledge–competency–problem" framework, the curriculum systematically presents both the theoretical and practical structure of the course, guiding students to independently identify learning priorities and plan personalized pathways for progressive learning [4].

Supported by an AI-powered learning diagnostics system, the program accurately identifies learners' capability gaps and cognitive differences, dynamically delivering customized learning content and adaptive resources to facilitate self-directed and adaptive learning.

Through a task-driven instructional approach grounded in authentic cases and enterprise-based practical projects, students deepen their application of knowledge and produce tangible outputs in real-world contexts [5].

This model also strengthens the emphasis on formative and stage-based assessment, enabling a closed-loop progression from knowledge acquisition to the development of practical competencies.

3.2 Intelligent Empowerment for a Data - Driven Teacher–Student–Machine Community

E-commerce instructors integrate course materials, enterprise cases, laboratory manuals, and academic literature to continuously train AI models, enabling the technology to evolve into an intelligent learning partner and an

experimental support tool for students. Instructors utilize AI-driven learning analytics to interpret behavioral data and dynamically adjust instructional pacing and content depth. Students engage in self-directed learning through AI-recommended resources, while AI agents play a substantial role in generating classroom cases, demonstrating knowledge structures, and guiding task execution. These functions collectively support instructional decision - making and scaffold knowledge construction [6]. In parallel, the curriculum establishes a collaborative development community involving instructors, learners, and industry mentors. All participants jointly engage in project implementation, formative evaluation, and outcome presentation, thereby advancing an intelligent classroom model grounded in human–AI co - teaching, co - learning, and co - assessment. Drawing on shared learning data, the three parties collaboratively diagnose learning progress and provide iterative feedback to refine instructional processes. Through group collaboration and project co - creation, the model fosters a new instructional ecosystem characterized by joint construction, shared creation, and collective ownership of learning outcomes.

3.3 Generative Learning Environments to Foster Student Innovation

The entire instructional process is characterized by pre - structured design, dynamism, openness, and generativity, and is centered on project - based and task - oriented learning. Students are guided to use AI - generated industry data and market cases to conduct in - depth analyses and develop solution proposals [7]. The curriculum embeds AI - assisted content creation activities, such as script writing, data analysis, and marketing model design, to enhance students' ability to apply knowledge in authentic scenarios. Through collaborative teamwork on real enterprise projects, students are further encouraged to critically examine and creatively reconstruct AI - generated outputs. This approach cultivates a generative learning pathway in which students "learn through doing and create through doing," stimulating active inquiry, critical thinking, and problem - solving abilities. It ultimately enables instructors and learners to engage in joint innovation and the co - construction of new knowledge.

4. Reconstructing Multimodal Teaching Content to Enhance Resource Utilization

The AI - enhanced course system is designed to address the diverse learning needs of students and is supported by large - scale AI models, intelligent agents, AIGC technologies, and other AI - powered tools. It constructs a multimodal and rich - media instructional resource framework that integrates interactive case libraries, knowledge graphs, short - form micro - lecture videos, and enterprise simulation environments [8].

These resources comprehensively cover all stages of instruction, from theoretical explanation to hands - on practical training, with the aim of enhancing learners' immersive experiences and deep cognitive engagement. The system further aims to improve the intuitiveness, logical coherence, and extensibility of instructional content.

In addition, the AI - enhanced system facilitates more individualized and adaptive learning processes by enabling real - time alignment between resource delivery and students' evolving cognitive states. Through continuous monitoring of learning behaviors and performance indicators, the system can recommend targeted materials, support learners' progression, and provide differentiated instruction that caters to varying competence levels and learning preferences [9].

The integration of multimodal content also makes abstract concepts more accessible. Knowledge graphs reveal the underlying structure of disciplinary knowledge, while scenario - based simulations allow students to contextualize theories within authentic commercial environments. Moreover, by enabling dynamic updates of instructional materials based on industry trends and data - driven insights, the system ensures that the curriculum remains current and in line with the rapidly evolving digital business landscape.

Collectively, these capabilities contribute to a more flexible, engaging, and future - oriented learning ecosystem that strengthens students' professional preparedness and promotes sustained knowledge development.

4.1 Reconstructing a Modular Knowledge-Graph Framework

Relying on core engine technologies, including knowledge extraction, multimodal enhancement, and other advanced analytical modules, the system conducts an in - depth examination of the

competency requirements for e - commerce industry positions. Based on the intrinsic relationships among knowledge points, it integrates resources from multiple online courses, such as Introduction to E - Commerce, Online Marketing, Livestream E - Commerce, and Business Data Analysis, along with digital textbooks, lecture slides, academic papers, videos, and other instructional materials. These materials are parsed and segmented into granular knowledge units.

In combination with human - annotated knowledge fragments, these units are reorganized around the core modules of the curriculum to reconstruct essential knowledge components and build a cross - course, interconnected knowledge graph with precise hierarchical structuring. The visualization of theoretical knowledge and application scenarios not only suits the fragmented learning patterns of the digital economy era but also lays the foundation for developing a comprehensive knowledge graph for the entire e - commerce discipline.

4.2 AIGC- and Agent-Driven Dynamic Resource Supply System

Relying on AIGC-based content generation and a 24/7 intelligent learning companion, the system continuously captures and interprets real-time industry developments, automatically generating multidimensional case packages. These packages include instructional cases, literature data, video materials, data reports, competitive analyses, and marketing plans.

Based on the high-frequency errors identified in learners' diagnostic reports, the system intelligently recommends targeted resources and creates personalized learning pathways. Through human - AI collaborative evaluation of student project outputs, industry mentors review and select high - quality submissions, which are then incorporated into the student case repository. This enables the reuse and continuous enrichment of high - quality resources [10]. This process establishes a dynamic resource supply mechanism characterized by "AIGC content generation–precise delivery–feedback integration."

Furthermore, the system's continuous learning loop ensures that resource updates reflect emerging industry practices, allowing learners to engage with timely and contextually relevant materials. As the volume of user interaction data accumulates, the recommendation algorithms become more refined, offering a more accurate alignment between learners' needs and instructional content. This iterative mechanism not only enhances instructional efficiency but also supports the development of a scalable and sustainable digital learning ecosystem.

4.3 A Virtual–Physical Integrated Ecosystem for Industry–Education Co-Development

By leveraging a cloud platform jointly developed by universities and enterprises, both parties can deeply share practical training resources.

In collaboration with local cross - border e - commerce associations, the program constructs a localized enterprise case library and jointly develops printed and digital teaching materials. Student teams engage in online co - creation to design e - commerce operation plans, marketing strategies, and related project outputs. The instructional content directly incorporates internal data reports and competitive analysis documents.

Industry mentors participate in virtual livestream training environments via the learning platform, offering real - time feedback on students' presentation scripts and integrating cutting - edge industry technologies into practical teaching [11].

This approach bridges authentic enterprise business scenarios with course content. Meanwhile, the cloud - based workspace enables continuous online monitoring and real - time guidance of students' practical training, thereby enhancing their workplace readiness and job - role adaptability.

4.4 AI-Driven Value-Based Learning Scenarios and Cultural Modules

Using AR/VR technologies, the program recreates the university's Leifeng Museum and historical cultural - education scenes. Coupled with AI - based scenario design, it develops contextualized value - oriented instructional modules, such as demonstrating the "Leifeng spirit" in team collaboration, to integrate values like perseverance, dedication, and data responsibility into project - based learning.

With AI support, value - oriented elements are further explored and embedded into course content in a narrative form, guiding students to develop appropriate value orientations and stimulating their intrinsic motivation for learning

[12]. This approach advances the educational goal of prioritizing value formation and holistic learner development within e - commerce training.

In addition, the use of immersive digital scenarios enables students to experience moral dilemmas, teamwork challenges, and ethically oriented decision - making processes in a highly interactive manner. By placing value - based content within authentic professional contexts, the curriculum strengthens learners' ability to internalize ethical principles and apply them in real - world business settings, thereby fostering deeper cultural understanding and enhancing the socio - emotional dimensions of their professional competence.

5. Developing Ubiquitous Smart Learning Environments to Extend Practical Engagement

Leveraging diverse instructional scenarios, virtual classroom learning data are utilized to dynamically refine training tasks within simulated environments. High - quality content from the learning community is transformed into teaching cases, which continuously enrich the case repository. Through interconnected data systems and multi - stakeholder collaboration, the program establishes an integrated "cloud–campus–enterprise–training base" framework that supports full - cycle competency development. This framework also enables real - time feedback loops and resource sharing, ensuring that instructional design remains responsive to learner performance and evolving industry requirements.

5.1 Building Multi-Device Virtual Classrooms to Enable Efficient Interactive Learning Cycles

Relying on smart classroom technologies and the learning platform, a virtual classroom is constructed via multi - terminal integration, enabling real - time resource sharing. Students engage deeply in classroom interaction through features such as live comments, feedback tags, and audio participation requests.

Instructors analyze real - time classroom data reports and dynamic alert mechanisms to accurately assess learners' progress and engagement. For example, in the "User Profiling Construction" module, timed polling activities are used to collect cognitive feedback, while instantly generated visual dashboards capture differences in understanding.

These data - driven insights allow instructors to flexibly adjust the instructional pace and, together with AI - based teaching assistants, provide targeted question guidance and in - depth case analysis, ultimately forming a closed - loop instructional cycle of "explanation–assessment–reinforcement".

5.2 Data-Enabled Learning Communities for Building a Knowledge-Sharing Ecosystem

Using the discussion forum functions of the learning platform, an ecological learning community is established to support students in freely expressing academic viewpoints and sharing their practical project outcomes. Instructors monitor interaction data to deliver precisely targeted supplementary resources, guide and regulate the focus of discussions, and facilitate the construction and sharing of knowledge [13].

For example, in the "Social Media Marketing" module, students upload their projects, such as designing a "viral Xiaohongshu post," to the community for display and mutual evaluation. Instructors then select high - quality submissions to enrich the course resource repository and further optimize instructional materials.

5.3 Virtual Livestreaming to Support Practical Training and Data-Driven Performance Review

By integrating livestreaming features from the learning platform and Feishu, a lightweight virtual studio is established to support practical training. In the Livestream E-Commerce Operations module, instructors assign simulated livestream projects where student teams assume roles such as host, producer, and customer service. Leveraging platform-based co - broadcasting tools and AI - assisted script libraries, learners simulate end - to - end livestream workflows and content creation. After class, instructors use exported replay videos and multidimensional performance reports to conduct targeted, data - informed review sessions. The combination of real - time interaction and analytical feedback not only improves students' operational proficiency but also enhances their ability to diagnose performance gaps and iteratively refine their practical strategies.

5.4 Cloud - Based University–Enterprise

Collaboration with Reconfigured Processes for Value - Oriented Learning

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Over time, this participatory cycle nurtures a sustainable knowledge-sharing ecosystem in which learners contribute to, refine, and benefit from a continuously evolving repository of collective insights.

6. Conclusions and Future Directions

In the context of artificial intelligence deeply empowering the education sector, the instructional reform model developed for e-commerce programs in this study offers a new paradigm for teaching transformation by adhering to the three core principles of "data-driven processes, multidimensional adaptability, and competence orientation." This model guides learners to shift from relying on AI to replace thinking to using AI to stimulate higher-order thinking.

Moreover, the innovative construction of a tripartite "teacher–student–machine" collaborative mechanism establishes an iterative "teaching–learning–practice" spiral, which enhances students' mastery of professional knowledge. Through multidimensional evaluation and continuous optimization, the model promotes the coordinated development of students' practical abilities and professional competencies, providing an intelligent, scalable, and actionable solution for talent cultivation in e-commerce education. This approach yields valuable insights for advancing the digital transformation of education in the new era.

Future research will further explore pathways for the deep integration of AI technologies into discipline-specific teaching and strengthen scenario-based adaptation of technological applications. Additionally, efforts will be directed toward refining intelligent evaluation systems to enhance accuracy and dynamism, thereby better meeting the diverse competency demands for interdisciplinary e-commerce talent in the digital economy.

Acknowledgments

This article was funded by the Undergraduate Teaching Reform Research Project of Shandong Provincial Department of Education (M2023294). This article is a phased research achievement of the smart course "Online Marketing" in Shandong Province.

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