ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202602_9(2).0002

Construction of an Integrated Teaching Model Combining Ideological and Political Education with the 4Cs Principle in the E-commerce Security Course under the Background of Artificial Intelligence

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Abstract

Against the dual backdrop of artificial intelligence reshaping the educational ecosystem and the escalating security demands of the e-commerce industry, the E-commerce Security course faces prominent issues such as the disconnection between ideological and political education and professional instruction, insufficient student agency, and a singular evaluation system. There is an urgent need to construct an integrated teaching model that combines value guidance with competency cultivation. This paper utilizes the 4Cs (Content - Communication - Cognition - Culture) teaching principles as a framework, leverages the empowering advantages of AI, and builds a teaching model that deeply integrates ideological and political education with the 4Cs. Through blended strategies like industry-academia collaborative practical training and debates on controversial issues, student agency is stimulated. A four-dimensional dynamic evaluation system is established, forming a closed-loop educational process of "model construction - resource development - practical application - evaluation and optimization." Teaching practice indicates that this model effectively enhances students' professional competence, ideological and political identification, and core competencies, addresses the pain points of traditional teaching, and provides a replicable practical paradigm for application-oriented universities to achieve the trinity educational goal of "knowledge imparting, competency shaping, and value guiding" in engineering courses.

Keywords

Artificial Intelligence; Curriculum-based Ideological and Political Education; 4Cs Teaching Principles; E-commerce Security; Dynamic Evaluation System.

1. Introduction

1.1. Research Background

With the vigorous development of the digital economy, e-commerce has become a significant growth engine for the national economy. However, security issues such as cyber-attacks, data breaches, and transaction fraud are increasingly prominent, placing higher demands on the security literacy and sense of responsibility of e-commerce professionals. The *E-commerce Security* course, as a core component of the e-commerce major, bears the dual mission of imparting security technical knowledge, cultivating practical abilities, and shaping correct values. Concurrently, the breakthrough development of artificial intelligence technology is profoundly reshaping the educational ecosystem. Applications of AI large models in areas like teaching resource generation and learning data analysis provide entirely new technological pathways for the reform of ideological and political education in courses.

At the national level, the construction of ideological and political education in curricula has transitioned from the "element extraction" phase to the "deep integration" phase, requiring universities to organically unify "value guidance, knowledge imparting, and competency

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cultivation." However, significant challenges persist in the teaching of the *E-commerce Security* course in current application-oriented universities. Firstly, a "two-layer skin" phenomenon exists between ideological and political elements and professional teaching. Content related to network ethics, data security responsibility, etc., is often presented as an add-on, lacking deep coupling with technical knowledge. Secondly, student agency and participation are insufficient. Traditional classrooms primarily rely on "teacher lecturing and case analysis," where students are mostly passive recipients, making it difficult to internalize ideological and political connotations and enhance core competencies. Thirdly, the evaluation system is singular, focusing on professional knowledge assessment while neglecting comprehensive evaluation of ideological and political literacy, collaborative skills, and other holistic qualities. Furthermore, the university also sets clear requirements for innovative teaching models and enhanced educational quality, necessitating the construction of an integrated teaching model suited to the needs of the new era.

1.2. Domestic and International Research Overview

(1) Research on the Application of Ideological and Political Education in Engineering Courses

Domestic scholars have conducted extensive research on ideological and political education in engineering courses, primarily focusing on the extraction of ideological and political elements and the exploration of integration paths [1]. In e-commerce-related courses, existing research often concentrates on refining ideological points such as integrity in business and legal awareness. However, issues like rigid integration models and a lack of systematic framework support are common. Most studies remain at the level of "case embedding" and fail to achieve deep symbiosis between ideological and political education and professional content [2]. Similar research abroad emphasizes technological ethics education, cultivating students' sense of technological responsibility through specialized ethics courses or modules. However, this differs fundamentally from the value-guidance connotation of China's "curriculum-based ideological and political education" and is not directly adaptable to the educational needs of domestic universities [3].

(2) Research on the Expanded Application of the 4Cs Teaching Principles

The 4Cs teaching principles (Content, Communication, Cognition, Culture) originated in the field of language teaching, emphasizing the synergistic development of these four dimensions [4]. In recent years, these principles have gradually extended to engineering courses. Researchers often apply them to optimize teaching content and innovate teaching methods, such as designing project-based teaching processes or constructing collaborative learning scenarios based on the 4Cs [5]. However, research deeply integrating the 4Cs with ideological and political education is scarce, and a mature teaching model framework has yet to be formed, especially lacking practical exploration empowered by artificial intelligence [6].

(3) Research Progress on Artificial Intelligence Empowering Ideological and Political Education

Research on the integration of AI and ideological and political education mainly focuses on two directions: Firstly, utilizing AI technology to assist in extracting ideological and political elements and developing teaching resources, such as generating case studies or creating multimodal teaching materials using large models [7]. Secondly, employing learning analytics technology to achieve precise evaluation of teaching effectiveness [8]. While existing research demonstrates the potential of technological empowerment, problems such as single application scenarios and disconnection from course teaching logic persist. A trinity integration system of "technology, teaching, and ideological and political education" has not been formed, and the research lacks specificity for engineering courses [9].

In summary, existing research has not adequately addressed core issues such as the deep integration of ideological and political education with professional teaching in engineering courses, the stimulation of student agency, and the construction of comprehensive evaluation

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systems. There is a particular lack of systematic research on teaching models that use the 4Cs as a framework and AI as an empowering tool. This constitutes the core starting point of this study.

2. Construction of the Integrated Teaching Model Combining Ideological and Political Education with the 4Cs

2.1. Core Framework Design of the Teaching Model

The integrated teaching model combining ideological and political education with the 4Cs is centered on the "Four-Dimensional Integration Framework" and implemented via the "Closed-Loop Operational Mechanism," forming a three-dimensional educational framework with theoretical systematicity and practical operability. This achieves the organic unity of ideological guidance, knowledge imparting, competency cultivation, and technological empowerment. Details are as follows:

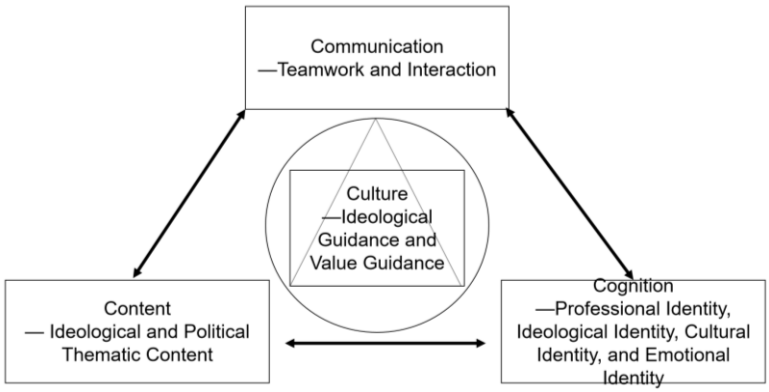

Figure 1. The 4Cs Integrated Teaching Principles Framework

First, the deep integration of value guidance and professional knowledge. Using the "Content" dimension as the carrier, bidirectional infiltration of professional technical knowledge and ideological and political connotations is achieved. On one hand, legal requirements such as the *Cybersecurity Law* and *Data Security Law*, along with ideological concepts like the "Holistic View of National Security," are embedded into course chapters. For example, in the "E-commerce Security Protocols" chapter, the "Alipay Cross-border Payment Vulnerability Fix" case is used to analyze the impact of technical compliance on national economic security. In the "Data Security and Privacy Protection" chapter, the *Personal Information Protection Law* is incorporated to discuss balancing "data sharing and privacy protection," strengthening students' legal awareness and sense of responsibility. On the other hand, ideological and political elements guide the optimization of knowledge presentation logic. Cases such as "Application of the Domestic SM4 Algorithm" and "Independent Innovation in Huawei's HarmonyOS Security Architecture" serve as entry points for knowledge, allowing students to accept value guidance subtly while mastering technical principles.

Second, the bidirectional integration of professional learning and cultural acquisition. Focusing on the "Cognition" and "Culture" dimensions, competency cultivation is bound with cultural literacy shaping. At the cognitive level, activities such as debates on controversial issues and localized innovation practices are designed. For instance, surrounding the "Ethical Controversy of Facial Recognition Technology Application in E-commerce," students are guided to propose solutions combining technology and law. Projects like "Optimizing Security Protocols for Cross-border Transactions of Xinjiang's Characteristic Agricultural Products" are conducted, encouraging students to integrate domestic cryptographic algorithms with regional needs. At the cultural level, paths such as comparative analysis of Chinese and Western solutions and technological ethics practices are employed. Comparing the international PCI DSS standard

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202602_9(2).0002

with China's *Multi-Level Protection Scheme for Cybersecurity* elucidates the adaptability of the Chinese approach. Students are required to write a *Technological Ethics Statement* for self-developed security tools, reinforcing the consciousness of "Technology for Good."

Third, the intelligent integration of course content and information technology. Relying on the "Communication" dimension and AI technology, an interactive teaching environment is constructed. On one hand, an AI large model is used to develop a multimodal resource library combining "Technology and Ideological-Political Education," covering formats like micro-lectures, animations, and case collections. On the other hand, blended teaching is employed to broaden communication scenarios. Online discussion communities are established to support cross-temporal and spatial communication. Offline, in collaboration with Bayin Guoling Zhi Yunda E-commerce Co., Ltd., "Security Emergency Response" practical training is conducted. Students work in groups, role-playing as technical, legal, and public relations teams to complete collaborative tasks, enhancing professional literacy.

2.2. Key Constituent Elements of the Teaching Model

Using the 4Cs "Content" dimension as the core, a dual-track teaching content system of "Technical Knowledge and Ideological-Political Connotation" is constructed. Evaluation implementation adopts a closed-loop mechanism of "Data Collection, Intelligent Diagnosis, Strategy Generation": ① Data Collection: Learning behavior data (resource viewing duration, answer accuracy), process-based outcomes (assignments, project reports), and multi-source evaluations (teacher, peer, enterprise) are automatically collected via the online platform. ② Intelligent Diagnosis: Utilizing the DeepSeek large model to analyze the multi-source data, generating student comprehensive literacy profiles and teaching effectiveness diagnostic reports. ③ Strategy Generation: Based on diagnostic results, personalized learning suggestions are provided to students (e.g., recommending supplementary resources for weak knowledge points), and teaching optimization plans are offered to instructors (e.g., adjusting teaching methods for a specific chapter), facilitating positive interaction between evaluation and teaching.

3. Practical Application of the Integrated Teaching Model

3.1. Practice Subjects

Two classes of the 2022 cohort E-commerce major from an application-oriented university were selected as practice subjects. The experimental class (44 students) adopted the integrated teaching model constructed in this study, while the control class (43 students) used the traditional teaching model (teacher lecturing, case analysis, and final assessment). The two classes showed no significant differences in entrance scores and learning foundations, ensuring comparability.

3.2. Implementation of Blended Teaching

Taking the "E-commerce Security Protocols" chapter as an example, its core objectives are to master the principles of encryption algorithms and security protocols, and to strengthen the awareness of national security and independent innovation. The specific teaching implementation unfolds across the "Pre-class, In-class, Post-class" chain, relying on online-offline blended teaching scenarios and integrating AI technology and ideological and political elements. The specific process is as follows:

Pre-class: Through the ChaoXing Learning Platform, an animation demonstrating the SM4 algorithm and a micro-lecture on the "Development History of Domestic Cryptographic Algorithms" are distributed. A question is assigned: "Why develop domestic encryption algorithms? How does this reflect the national security concept?" Students learn online and leave comments for discussion, while the platform collects learning data.

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In-class: ① Scenario Introduction: A news clip about "Cross-border E-commerce Payment Data Stolen Overseas" is played to elicit the importance of security protocols. ② Knowledge Lecture: Symmetric/Asymmetric encryption algorithms and SSL/TLS protocols are explained, comparing international algorithms with domestic SM2/SM4 algorithms. ③ Ideological and Political Discussion: Centering on the "Alipay Cross-border Payment Vulnerability Fix" case, the impact of technical compliance on national economic security is discussed, and the requirements for encryption technology application in the *Cybersecurity Law* are interpreted. ④ Practical Operation: Students work in groups using a virtual training platform to simulate the e-commerce payment encryption process based on the SM4 algorithm, with guidance from teachers and enterprise experts in real-time.

Post-class: The task of designing an "Optimization Plan for Security Protocols of an E-commerce Platform" is assigned, requiring the integration of domestic algorithms and compliance requirements. Students submit a proposal report and design explanation to reinforce knowledge application and a sense of responsibility.

3.3. Course Development and AI Technology Application

Relying on the ChaoXing Learning Platform, an online open course for *E-commerce Security* was established, constructing a teaching resource system with online-offline linkage. During blended teaching implementation, the online platform primarily undertakes tasks such as pre-class preview, resource expansion, and online interaction. Offline classrooms focus on in-depth discussion, practical training, and ideological-political immersion, achieving complementary advantages and collaborative education between online and offline modes.

AI technology empowers blended teaching throughout the entire process, enhancing teaching precision and efficiency. Specific applications are manifested in four aspects: ① Intelligent Resource Push: Based on students' pre-class learning data profiles, personalized supplementary resources are automatically distributed. For example, students with weak understanding of encryption algorithms receive targeted distribution of algorithm demonstration videos and specialized exercises to meet personalized learning needs. ② Intelligent Interactive Feedback: Through Rain Classroom, real-time in-class quiz data is collected, quickly generating statistical reports. Teachers adjust teaching pace and focus points flexibly based on the reports to precisely gauge student understanding. ③ Intelligent Assignment Grading: Automatic grading of objective questions is realized, and AI provides assisted grading suggestions for subjective questions, significantly reducing teachers' grading workload and improving evaluation efficiency. ④ Learning Behavior Analysis: The platform automatically tracks and analyzes student learning trajectories, accurately identifying students with signs of learning aversion or difficulties. Teachers provide personalized tutoring and targeted interventions for such students, ensuring the comprehensiveness of teaching.

4. Verification of Practical Effects

To comprehensively verify the effectiveness of the integrated teaching model, this study employed a combination of quantitative data and qualitative feedback, conducting verification from multiple dimensions including professional competence, comprehensive abilities, ideological and political identification, and teaching satisfaction, ensuring the objectivity and comprehensiveness of the evaluation results.

Regarding the mastery of professional knowledge, the overall learning outcomes of students in the experimental class were significantly better than those in the control class using the traditional teaching model. The experimental class achieved an average score of 82.3, a pass rate of 97.8%, and an excellence rate of 35.6%. In contrast, the control class had an average score of 75.6, a pass rate of 88.4%, and an excellence rate of 18.6%. Statistical tests indicated

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that the difference between the two groups was statistically significant. This indicates that the integrated teaching model, through the organic combination of multimodal resource preview, in-depth classroom discussion, and practical training, effectively strengthened students' understanding and application abilities of core knowledge such as encryption algorithms, security protocols, and data compliance. Particularly in solving complex problems, students in the experimental class demonstrated more solid knowledge reserves.

In terms of cultivating comprehensive abilities, evaluation based on the 4Cs dimensions showed that students in the experimental class achieved relatively high scores across all four dimensional indicators, with overall outstanding performance. In the Communication dimension, through activities like industry-academia collaborative training and cross-role collaboration, students' collaborative and expressive abilities and professional awareness improved significantly. Most students could communicate effectively and define clear roles in team projects, receiving positive feedback from enterprise training mentors. In the Cognition dimension, debates on contradictions and localized innovation practices effectively stimulated students' dialectical thinking. Nearly 90% of the students designed security plans with clear innovative points; some plans closely aligned with actual enterprise needs, reflecting strong practical innovation capabilities. In the Culture dimension, comparative analysis of Chinese and Western solutions and technological ethics practices strengthened students' cultural confidence and ethical awareness. They could clearly recognize the advantages and value of Chinese technological solutions. The written *Technological Ethics Statements* demonstrated a clear concept of "Technology for Good." In the Content dimension, students not only solidly mastered professional knowledge but also developed a deeper understanding of ideological and political connotations such as cyber ethics and the national security concept, achieving synergistic enhancement of knowledge and value.

Simultaneously, some issues requiring optimization were identified during the practice: A minority of students showed insufficient participation in teamwork, exhibiting a "free-rider" phenomenon; The integration methods for ideological and political elements in some complex technical chapters still need refinement to avoid forced attachment; The depth of comparative analysis between Chinese and Western cultures needs strengthening. These issues will serve as key directions for subsequent optimization of the teaching model, aiming to continuously improve educational effectiveness by improving team management mechanisms and deepening instructional design.

5. Conclusion and Outlook

Using the *E-commerce Security* course as a vehicle, this study successfully constructed and practiced an integrated teaching model combining ideological and political education with the 4Cs under the background of artificial intelligence. Through the triple integration dimensions of "value guidance and professional knowledge, professional learning and cultural acquisition, course content and information technology," and the closed-loop operational mechanism of "model construction, resource development, practical application, evaluation and optimization," this model effectively addressed pain points in traditional teaching, such as the disconnection between ideological and political education and professional content, insufficient student agency, and a singular evaluation system. It achieved the organic unity of knowledge imparting, competency shaping, and value guidance. Practice demonstrated its ability to significantly enhance students' professional competence, ideological and political identification, and core 4Cs competencies such as collaborative communication, dialectical thinking, and innovative practice, receiving high recognition from students and industry-academia partners. The constructed teaching content system, implementation process, and evaluation system possess strong replicability and can serve as a reference for ideological and

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political education reform in similar engineering courses. Simultaneously, this study has limitations, including a limited scope of practice samples, insufficient long-term validation of educational effects, and insufficient application depth of AI in areas like qualitative evaluation. In the future, the practical scope of this teaching model will be further expanded to other courses within the e-commerce major and similar engineering courses. The integration of AI technology in constructing ideological and political scenarios and providing personalized guidance will be deepened. The four-dimensional evaluation system will be optimized in conjunction with long-term tracking data. Research outcomes will be disseminated through publication of papers, teacher training, and resource sharing to continuously refine the educational paradigm and assist application-oriented universities in cultivating high-quality interdisciplinary talents.

Acknowledgements

(1) 2025 Xinjiang Uygur Autonomous Region Educational Science Planning Project: Exploration and Practice of the "One-core, Four-drive and Five-integration" High-level Application-oriented Technical Talent Training Mode for Information Security Major (HEN2025012)
(2) 2025 University-level Project: Research on the Integrated Teaching Model Combining Ideological and Political Education with the 4Cs Principle under the Background of Artificial Intelligence: A Case Study of the "E-commerce Security" Course (KCSZPT-2025-09)

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