2025 Volume 3, Issue 5
Educational Innovation Research
ISSN: 3029-1844(Print)
ISSN: 3029-1852(Online)

AI-Empowered Innovative Research on Teaching Content in Fundamental Computer Courses

Min Zhao, Sha Yang
HanKou University, Wuhan 430000, Hubei, China

Abstract

This study focuses on the teaching of Office software in fundamental computer courses, addressing issues such as repetitive basic operations and the lack of intelligent tool applications in traditional teaching. It conducts innovative research on AI-empowered teaching content. The study establishes guiding principles centered on "student-focused design, deep integration of technology and content, dynamic updates, and balanced theory-practice alignment." It designs three innovative dimensions—intelligent tool integration, scenario-based training, and personalized learning—forming an "input-process-output-feedback" holistic innovation model. By reconstructing the core modules of intelligent document processing, data analysis, and presentation design, the study achieves deep integration of AI technology with Office teaching. A three-tier evaluation framework (basic skills, intelligent tool application, and scenario-based application) combines quantitative and qualitative methods for assessment. Results show that the experimental group maintained stable basic skills while demonstrating a 3.2-fold increase in intelligent tool usage frequency, a 40% improvement in complex task efficiency, and a 32% boost in learning interest, with particularly significant benefits for low-proficiency students. The study validates the effectiveness of AI-empowered Office teaching, providing practical insights for reforming fundamental computer courses.

Keywords

AI-empowered teaching; fundamental computer courses; teaching content innovation; personalized learning; scenario-based training

Online publication: June 26, 2025

1. Introduction

As a core vehicle for developing students' digital literacy, basic computer courses are plagued by outdated teaching content and methodologies, which have become a critical bottleneck hindering improvements in teaching quality[]. In actual classroom practice, all three core modules present significant pain points, with prominent common issues.

The rigidity of content is particularly evident in Office software instruction. Most textbooks remain focused on explaining features of older versions, failing to keep pace with the software's continuous iterations, and offer woefully inadequate coverage of AI-assisted functions such as Office Copilot[]. Teaching content overemphasizes basic operational demonstrations while neglecting in-depth exploration of practical scenarios like automated office workflows and efficient data processing. Consequently, students, despite mastering basic operations, struggle to meet the demands of complex real-world tasks, with a notable gap in developing efficient application skills[]. Furthermore, they often fail to adapt to new work paradigms in intelligent office settings—such as prompt engineering and automated content generation—resulting in a mismatch between acquired skills and job market needs[].

To overcome these challenges, a new teaching model supported by AI technology must be established[]. Intelligent dynamic content generation can ensure teaching cases remain up-to-date; personalized learning path recommendations can cater to students' diverse foundational levels; and virtual experiment environments, coupled with real-time error diagnosis, can significantly enhance the effectiveness of practical teaching. This innovation not only addresses current pedagogical shortcomings, shifting the focus from "knowledge transmission" to "ability development" but also strengthens students' practical application and problem-solving skills, laying a robust foundation for their future career growth[].

2. Barriers to AI-Enabled Innovation in Basic Computer Course Content

Three key obstacles currently hinder the integration of AI technology with basic computer courses:

2.1. Inadequate Adaptability Between Technology and Content

AI technology faces multiple practical barriers in innovating basic computer course content, restricting the in-depth integration of technology and teaching[]. A core bottleneck lies in the poor adaptability between technology and content: most existing AI tools are developed for general scenarios and cannot directly meet specialized teaching needs[]. They lack customized designs for modules such as Office, operating systems, and networks, leading to a disconnect between technical applications and teaching requirements, which fails to effectively support content innovation.

2.2. Insufficient AI Tool Application Capabilities Among Teachers

Teachers' inadequate proficiency in using AI tools forms a critical implementation gap. Most instructors of basic computer courses excel in traditional teaching methods but lack AI literacy. They have not received systematic training in operating AI tools or integrating them into teaching, and have limited understanding of the functional features and educational value of intelligent tools like Office Copilot[]. This makes it difficult to organically merge technology with teaching in content design, hindering the advancement of innovative practices and leaving teachers unable to guide students in using these tools to solve practical problems[].

2.3. Scarcity of Scenario-Based Resources

The lack of scenario-based resources creates a resource barrier. Most current AI teaching applications remain at the level of basic function demonstrations, lacking case libraries that reflect real-world work scenarios[]. High-quality resources such as AI-powered visual courseware and virtual simulation experiments tailored to course needs are severely insufficient. Teachers face high costs and great difficulties in independent development, making it hard to build content systems that support personalized learning and interactive experiences. This leaves AI-enabled content innovation without substantial carriers.

These barriers collectively restrict the in-depth application of AI technology in course innovation. Overcoming these bottlenecks requires collaborative efforts from technology developers and teachers—through customized development, systematic training, and joint resource building—to truly unlock AI's potential in education[].

3. Construction of an AI-Enabled Framework for Teaching Content Innovation

3.1. Guiding Principles

In constructing an AI-enabled innovation framework for basic computer courses, the following core principles should be adhered to to ensure the organic integration of technological applications and teaching needs:

First, the "student-centered" design philosophy must be upheld as the fundamental orientation of the framework[]. The framework should be developed around students' actual learning needs and cognitive characteristics. By leveraging AI technologies to analyze learning behavior data, it can achieve precise content delivery and personalized learning pathways, addressing the contradiction between uniform teaching and diverse needs. For instance, differentiated Office cases can be recommended to students with varying foundations based on learning behavior analysis, or the difficulty of operating system experiments can be dynamically adjusted according to operation records.

Second, emphasis should be placed on the "in-depth integration of technology and content" to avoid formalistic application of technology. AI technology should not remain superficial but be deeply embedded in the course knowledge system[]. Exclusive integration schemes should be developed for the three core components of Word, Excel, and PowerPoint: Word teaching should integrate Copilot's intelligent writing and proofreading functions; Excel teaching should incorporate intelligent data analysis and visualization tools; and PPT teaching should embed AI design suggestion modules. This integration ensures AI technology becomes an organic part of content learning rather than an add-on tool, truly serving the cultivation of efficient office capabilities.

Third, a "dynamic update" mechanism should be established. This principle emphasizes the creation of a content iteration system, which uses AI to track technological developments and teaching feedback in real time, promptly incorporating new software functions and network scenarios. This addresses the issue of curriculum lag and maintains content timeliness.

Fourth, the "balance between theory and practice" principle must be maintained. At the cognitive level, AI visualization tools are used to dynamically demonstrate abstract concepts such as PPT design principles and Excel function logic. At the practical level, virtual office environments simulate real work scenarios, such as full-process training in creating annual corporate financial reports. At the innovation level, AI collaboration platforms support complex tasks, such as intelligent conflict resolution during multi-person collaborative editing. This progressive design of "theoretical cognition-simulated practice-innovative application" ensures students not only master core skills but also adapt to the development needs of the intelligent office era.

These principles collectively form the foundation for AI-enabled teaching innovation. Only through their systematic implementation can substantial improvements in teaching quality be achieved.

3.2. Core Innovation Dimensions and Pathways

In advancing the intelligent transformation of basic computer courses, breakthroughs must be achieved in the following three core innovation dimensions, with a multi-dimensional collaborative pathway established to realize in-depth integration of technology and teaching.

3.2.1. Intelligent Tool Integration Dimension

This dimension focuses on the organic integration of AI office tools with course content, transforming cutting-edge AI office tools into teaching resources[]. For the Office module, tools such as Microsoft 365 Copilot are incorporated into the Office teaching system, and a "smart prompt engineering" teaching module is designed to guide students in efficiently completing document generation and typesetting, intelligent data analysis, and automated presentation design through natural language instructions. Through a three-level teaching pathway—tool function demonstration, case-based practice, and application transfer—students master AI-assisted efficient office methods, addressing the disconnect between course content and intelligent office scenarios, and forming a closed loop for cultivating tool application capabilities.

3.2.2. Scenario-Based Training Dimension

To tackle the pain point of lacking real-world scenarios in Office teaching, this dimension prioritizes building an intelligent scenario simulation system and creating an immersive learning environment to resolve difficulties in teaching abstract content. A hierarchically progressive office scenario simulation system is constructed: the basic level simulates daily office tasks (e.g., meeting minutes drafting, data report creation); the advanced level reconstructs professional scenarios (e.g., academic paper formatting, market data analysis report generation); and the high-level designs comprehensive projects (e.g., crossdepartmental collaborative document management, large-scale conference presentation planning). Each scenario embeds an AI scenario generator that dynamically adjusts task difficulty and requirements based on students' majors—for example, adding data verification scenarios for finance students and emphasizing document standardization scenarios for literature students.

3.2.3. Personalized Learning Dimension

This dimension achieves precise teaching provision through learning behavior analysis. An AI system collects students' operation data and practice feedback to construct learner capability profiles, enabling differentiated adaptation of content delivery. Differentiated learning pathways are designed for students with varying foundations: for those with weaker foundations, content such as "operation step decomposition + basic template application" is provided to strengthen basic skills like format setting and formula application; for more capable students, advanced challenges such as "AI prompt optimization + complex scenario resolution" are offered. Combined with AI intelligent diagnosis functions, personalized guidance is provided to resolve the conflict between uniform teaching and differentiated needs, improving learning efficiency and outcomes.

These three dimensions interact synergistically: tool integration provides intelligent support for scenario simulation, scenario simulation generates behavioral data required for personalization, and personalized optimization enhances the effectiveness of tool integration—jointly driving the upgrading of Office teaching toward intelligence and efficiency.

3.3. Overall Innovation Model

This study constructs a closed-loop innovation model of "input-process-output-feedback" to systematically promote the intelligent transformation of basic computer courses.

In the input phase, the model integrates multi-dimensional data sources: The teaching resource library provides standardized Office cases, including operation guides for various versions of Word/Excel/PPT, industry template libraries, and intelligent tool manuals; real-time collection of students' operation data—such as software usage trajectories, experiment error records, and practice completion status—lays a data foundation for personalized teaching.

The process phase serves as the core of the model, relying on AI technology to achieve in-depth transformation of Office teaching. Through the tool integration pathway, Copilot's intelligent functions are embedded to provide real-time guidance in document creation, data processing, and other links; The scenario simulation pathway builds a hierarchical office scenario system, dynamically generating practical tasks matching students' majors; The personalized pathway pushes differentiated content based on capability portraits—for example, step-by-step tutorials for beginners and AI prompt optimization schemes for advanced learners. AI algorithms analyze learning behaviors in real time, dynamically adjusting content difficulty and presentation methods to form an intelligent teaching flow.

The output phase focuses on improving application capabilities. Through intelligent training, students master

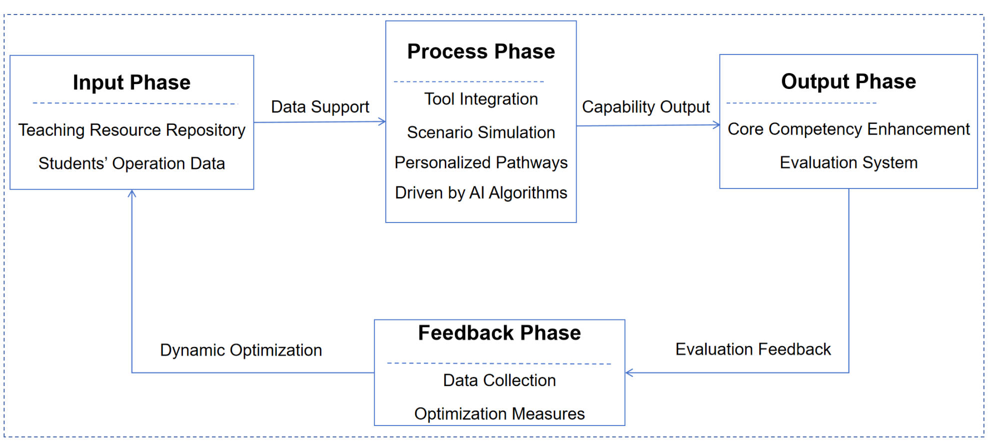

Figure 1. Overall Innovation Model of AI - Empowered Office Teaching

three core competencies: AI-assisted efficient document creation, intelligent data processing and visualization, and professional scenario presentation design. The evaluation system quantifies results from dimensions such as operation efficiency, document standardization, and tool application proficiency, with emphasis on monitoring the actual application level of AI tools in collaborative office work.

The feedback phase forms a continuous optimization mechanism. Based on output evaluation data and feedback from teachers and students, the teaching case library is dynamically updated, and AI recommendation strategies are adjusted to ensure the continuous evolution of teaching content. Through data-driven and continuous iteration, this model achieves a spiral improvement in teaching quality and learning efficiency.

4. Innovative Design of Core Teaching Content Modules

Aiming at the pain points in the teaching of Office software, such as repetitive basic operations, lack of intelligent tool applications, and detachment from actual scenarios, this paper reconstructs the teaching content of three core modules through AI technology, and builds an innovative system of "Tool Integration + Scenario-based Practice + Competency Advancement", so as to reshape the teaching paradigm of basic computer courses.

4.1. Innovation of the Intelligent Document Processing Module

The Word module focuses on cultivating the ability of intelligent document creation and breaks through the limitations of traditional typesetting teaching. An innovative "AI + Document" teaching unit is designed. At the basic level, the necessary format - setting teaching is retained, while the content of integrating Copilot is mainly developed: New "Intelligent Writing Assistant" teaching content is added to guide students to realize manuscript generation, style adjustment, and multi-version iteration through precise prompt words; A practical project of "Document Automation Processing" is designed, such as using AI to batch-process contract documents and standardize the format of academic papers. A supporting intelligent proofreading tool is developed to detect format errors and content logic problems in real time.

4.2. Innovation of the Intelligent Data Analysis Module

The Excel module solves the difficulties in data teaching through intelligent analysis tools and reconstructs the teaching content system. In the basic operation link, repetitive content is streamlined, and the focus is shifted to the teaching of AI data tools: A core unit of "Intelligent Data Analysis" is developed to teach students to use Copilot to realize data cleaning, automatic function generation, and trend prediction; A practical project of "Automated Visual Report" is designed. Combined with the AI recommendation function, students learn about the adaptation of chart types and the production of dynamic graphs. "Scenario-based Data Tasks" are innovatively introduced, such as real cases like year-on-year sales data analysis and student performance statistics. An AI diagnosis function is embedded to provide real - time feedback on formula errors and optimization suggestions. For students with different data foundations, hierarchical practice materials are provided to realize the progression of abilities from basic function application to complex data modeling.

4.3. Upgrade of the Intelligent Presentation Design Module

The PowerPoint module realizes teaching upgrade relying on AI design tools and solves the pain points of poor presentation effects and low production efficiency. The teaching content of "Presentation Design" is reconstructed, and a new unit of "AI Layout Planning" is added. Students learn to generate PPT frameworks that conform to the theme through prompt words; The teaching content of "Intelligent Visual Element Matching" is developed, so that students can master the skills of AI-assisted picture screening, color scheme recommendation, and animation design. An innovative "Full-process Presentation Project" is designed. From demand analysis, content architecture to final presentation, functions such as AI-generated speech notes and time-control reminders are integrated.

The innovative design of the three modules all takes AI tools as support and scenario-based practice as the carrier, realizing the ability to leap from basic operations to intelligent applications, and significantly improving the practicality and advancement of teaching content.

5. Evaluation and Analysis of Application Effects

5.1. Evaluation Scheme

To verify the innovative effects of the AI-empowered teaching content for the Office software module, a multi-dimensional evaluation scheme has been constructed. For the evaluation subjects, a comparative study is conducted between an experimental group and a control group. The experimental group adopts AI-integrated teaching content, while the control group continues with the traditional teaching model. The two groups of students are consistent in terms of their basic academic level and major distribution to ensure the scientificity of the evaluation. The evaluation cycle covers the entire teaching phase, including three stages: pre-class basic testing, in-class formative assessment, and post-class comprehensive evaluation.

The evaluation index system focused on core Office competencies, with three levels of evaluation dimensions: The basic competency dimension assessed foundational indicators such as document format standardization and data calculation accuracy; the intelligent tool application dimension evaluated proficiency in using AI features (e.g., Copilot) and the precision of prompt words; the scenario application dimension measured the quality and efficiency of completing complex office tasks. Learning experience indicators were also included, with questionnaire data on interest, satisfaction, and autonomous learning willingness to comprehensively reflect teaching effectiveness.

The evaluation method combined quantitative and qualitative approaches: Quantitatively, objective data such as students' document completion efficiency and AI tool usage frequency were analyzed through operation logs; an automated scoring system was developed to accurately assess quantifiable content (e.g., Excel function application, PPT layout design). Qualitatively, comprehensive abilities such as document logicality and data visualization effects were evaluated through work analysis; focus group interviews were conducted to collect feedback from teachers and students on AI teaching content and suggestions for improvement.

The evaluation process emphasized data tracking. An AI system recorded students' operation trajectories and tool usage preferences to generate personal competency development curves. Differences between the two groups in task completion quality and intelligent tool application ability were compared to verify the actual effect of AI-empowered teaching content on improving Office application skills.

5.2. Result Analysis

Based on data from the multi-dimensional evaluation scheme, the application effects of AI-empowered Office teaching content showed significant advantages, specifically reflected in the differential improvement between the experimental and control groups.

In terms of core competencies, the experimental group maintained stable performance in basic competency indicators, with no significant differences from the control group in document format standardization or data calculation accuracy—indicating that AI-integrated teaching did not weaken the cultivation of basic skills. Significant differences were observed in the intelligent tool application dimension: The experimental group's average Copilot usage frequency was 3.2 times that of the control group, with prompt word precision scores 28% higher, and 85% of students could independently complete AI-assisted document optimization—demonstrating that AI teaching content effectively improved intelligent tool application abilities. The scenario application dimension showed the most notable improvement: The experimental group reduced the average time to complete complex office tasks by 40% and achieved 35% higher task quality scores, with outstanding performance in comprehensive scenarios such as data visualization and multi-document collaboration.

Learning experience data showed that the experimental group's interest score was 32% higher than the control group's; 91% of students reported that AI-assisted features enhanced their learning confidence, and their average autonomous learning time increased by 2.1 hours per week. Qualitative feedback indicated that students generally recognized scenario-based cases and real-time feedback functions, believing AI tools helped them overcome the bottleneck of "knowing how to operate but not how to apply." Teacher interviews revealed that the experimental group's after-class consultation frequency for office tasks decreased by 50%, with significantly enhanced autonomy in problem-solving.

Competency development curves showed differentiated characteristics: The experimental group experienced a competency leap in the middle of the teaching phase, while the control group progressed steadily. Students with weaker foundations showed the largest improvement in the experimental group, as intelligent prompts and tiered guidance effectively addressed their baseline deficiencies; students with stronger foundations excelled in advanced AI tool applications, forming a development path of "basic consolidation—competency leap—innovative application." Overall data verified the effectiveness of AI-empowered teaching content in improving Office application abilities and learning experience.

6. Discussion and Outlook

This study verifies the significant value of AI-empowered Office teaching content, providing practical references for the reform of basic computer courses. Research shows that the in-depth integration of AI technology and Office teaching can significantly improve students' ability to apply intelligent tools and solve scenario-based problems without weakening basic skills. In particular, it has a prominent supportive effect on students with weak foundations, effectively alleviating the challenges of personalized teaching. However, the research still has limitations: AI tools iterate rapidly, and the lag in updating teaching content has not been fully resolved; the teaching of AI prompts in complex scenarios lacks depth, leaving some students still deficient in advanced application capabilities.

Future research plans to deepen in three aspects: first, establish a dynamic update mechanism for teaching content to keep pace with Office AI function upgrades in real time; second, develop a hierarchical prompt training system to strengthen the teaching of intelligent tool applications in complex scenarios; third, expand cross-software collaboration scenarios, explore the teaching application of AI in the integration of Office and other office tools, and build a more comprehensive training system for intelligent office capabilities.

Funding

This paper is one of the achievements of the Teaching Reform Research Project of Hankou University entitled "Research on AI-Enabled Innovation in Teaching Content of Basic Computer Courses" (Project No.: 2025JY24). This paper is one of the achievements of the "Research on AI-Enabled Innovation in Teaching Content of Basic Computer Courses" (Project No.:250405211181011), a project under the Ministry of Education's Industry-University Cooperation and Collaborative Education Program.

Disclosure statement

The author declares no conflict of interest.

References

[1] Kan Y, Pan Y, Wang J, 2024, Exploration and practice of teaching reform in college basic computer courses based on the concept of effective teaching. Computer Education, 2024(3): 55-58, 63.

[2] Liu X, Wang Z, Chen J, 2025, Research on AIGC technology empowering teaching reform of basic computer courses. Journal of Military Higher Education, 48(1): 50-54, 93.

[3] Microsoft. Work Trend Index Special Report: AI at Work. Redmond: Microsoft Corporation, 2023: 15-18.

[4] Chinese Academy of Educational Sciences. Research Report on the Application of Generative Artificial Intelligence Technology in the Field of Education. Beijing: Chinese Academy of Educational Sciences, 2025.

[5] Qinghua Z, 2024, AI Empowers the Creation of a New Pattern for Future Education. China Higher Education Research, 2024(3):1-7.

[6] Yi K, Han X, 2025, From Blended Teaching to Human-Intelligent Collaborative Teaching: A New Form of Teaching Under the Transformation of Generative Artificial Intelligence Technology. China Distance Education, 45(04):85-98.

[7] Wu D, Sun X, 2024, Research on people-oriented AI literacy education: Interpretation and enlightenment of UNESCO's AI competency framework for teachers and students. Journal of Agricultural Library and Information, 36(8): 4-19.

[8] Mu S, Chen X, Zhou D, 2025, Analysis of Generative AI Empowering Instructional Design: Needs, Methods and Development. Open Education Research, 31(1):61-72.

[9] Teacher Education Department, Ministry of Education. National report on teachers' digital literacy[R]. Beijing: People's Education Press, 2023.

[10] Chinese Academy of Educational Sciences. Research Report on the Application of Generative Artificial Intelligence Technology in the Field of Education. Beijing: Chinese Academy of Educational Sciences, 2025.

[11] Central Institute for Educational Technology. Development report on educational applications of artificial intelligence. Beijing: Educational Science Press, 2022: 15-18.

[12] Deng L, 2025, Obstacles and Strategies for Implementing Educational Artificial Intelligence Ethical Principles in the Context of the Development of Artificial Intelligence Technology. Education Exploration, 2025(07):6-11.

[13] HolonIQ, 2023, Global Educational Technology Trends Report. New York: HolonIQ, 2023:33-35.

[14] Chen Y, 2024, Curriculum Development Based on Artificial Intelligence Technology: A Review of "In-depth Integration and Innovative Application of Artificial Intelligence and Education Teaching". Yangtze River, 55(12):265-266.

[15] Mu S, Chen X, Zhou D, 2025, Analysis of Generative AI Empowering Instructional Design: Needs, Methods and Development. Open Education Research, 31(01):61-72.

Publisher' s note

Whioce Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.