Education and Social Work
ISSN Print: 3079-515X
ISSN Online: 3079-5168
https://doi.org/10.63313/ESW.9020

AI Empowered College Classroom:The Role of DeepSeek in Teaching

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How to cite this paper: Ding, X., Hu, S., & Liu, M. (2025). AI Empowered College Classroom: The Role of DeepSeek in Teaching. Education and Social Work, 1(2), 171–176. ISSN Print: 3079-515X; ISSN Online: 3079-5168.
https://doi.org/10.63313/ESW.9020
Published: 2025-04-21

Abstract

The evolution of generative artificial intelligence technology offers new possibilities for the digital transformation of higher education classrooms. This study takes the domestic intelligent model DeepSeek as the research object to explore its functional positioning, application value, and potential challenges in the teaching scenarios of colleges and universities. Through literature analysis and theoretical construction, combined with observations of teaching practices, it proposes that DeepSeek assumes three roles in classroom teaching: as an intelligent lesson preparation assistant for teachers, a personalized learning support tool for students, and a medium that enhances interaction between teachers and students. The research reveals that DeepSeek can promote the intelligent reconstruction of the teaching process and the transformation of the "student-centered" classroom ecology through functions such as real-time knowledge retrieval, adaptive question-and-answer feedback, and multi-modal resource generation. However, its application also encounters problems such as technical reliability limitations, academic ethical disputes, and insufficient digital literacy adaptation among teachers and students. The study suggests that colleges and universities need to establish a "technology-teaching-ethics" collaborative framework, clarify the auxiliary boundaries of artificial intelligence tools, and achieve the deep integration of DeepSeek and classroom teaching through institutionalized training and normative guidance. This study provides theoretical references and practical inspirations for the teaching reform driven by generative AI in colleges and universities.

Keywords

Generative Artificial Intelligence; DeepSeek; University Classrooms; Innovation in Teaching Models; Educational Ethics

1. Introduction

1.1 Research Background and Significance

With the breakthrough development of generative artificial intelligence (Generative AI) technology, the education field is experiencing a paradigm shift from "technology-assisted" to "intelligent empowerment". General large language models (LLMs) represented by GPT-4 and Claude have shown potential in scenarios such as lan-

guage learning and automatic grading. However, their application in vertical education scenarios still faces issues such as insufficient specialization and ambiguous ethical risks. In this context, the domestic intelligent model DeepSeek, with its deep adaptation to the Chinese context, enhanced logical reasoning capabilities, and multi-modal interaction features, is gradually becoming an important technical option for the intelligent transformation of higher education.

University classrooms, as the core domain for knowledge dissemination and innovation, have long faced multiple challenges. Firstly, the traditional "teacher-centered" model is difficult to meet the individualized learning needs of students. Secondly, the interaction between teachers and students is limited by time, space, and resources, making it challenging to achieve in-depth learning guidance. Thirdly, the integration of cross-disciplinary knowledge and the cultivation of complex problem-solving abilities urgently require technical tool support. The technical characteristics of DeepSeek (such as dynamic knowledge retrieval, real-time feedback generation, and multi-task collaboration) provide new approaches to address these pain points, but its role positioning, application boundaries, and potential risks in teaching scenarios still require systematic exploration.

This study focuses on the educational adaptability of DeepSeek in university classrooms, and its significance is manifested in both theoretical and practical dimensions. Theoretically, it breaks through the existing generalized discussions on general AI tools and constructs a role analysis framework for intelligent technology in vertical education scenarios, expanding the practical connotation of the "human-machine collaborative teaching" theory. Practically, it provides strategic references for the implementation of AI tools by university teachers, promotes the deep integration of technology empowerment and educational goals, and contributes to the coordinated improvement of teaching efficiency and quality.

1.2 Research Objectives and Questions

This study aims to explore how DeepSeek can restructure the teaching model in university classrooms and analyze its role positioning as a technical intermediary in the "teacher-student-knowledge" triadic relationship. Specifically, it is decomposed into the following three research contents: (1) At the functional positioning level, it focuses on the differentiated technical support provided by DeepSeek in teaching links such as lesson preparation, teaching, and assessment. (2) At the influence mechanism level, it reveals the specific change paths of the application of DeepSeek on the interaction mode between teachers and students and students' learning behaviors. (3) At the application boundary level, it clarifies the ethical and educational risks that need to be avoided in the process of technology empowerment. Through systematic analysis of these issues, this study attempts to reveal the collaborative laws between generative AI and university classrooms and construct an educational integration theoretical model that can be transferred to other technical tools.

2. Literature Review

2.1 Research Progress on the Application of Artificial Intelligence in Education

The application of artificial intelligence technology in the education sector has undergone a paradigm shift from "computational assistance" to "intelligent empowerment". In the early stage, represented by intelligent tutoring systems (ITS) and adaptive learning platforms, it provided standardized learning path recommendations through algorithmic analysis of student behavior data. Although it enhanced personalized efficiency, it was limited by closed rule bases and struggled to cope with complex teaching scenarios. With the breakthrough in natural language processing technology, generative AI (such as the GPT series of general large language models) has expanded into innovative scenarios through dialogue interaction and knowledge graph construction, including automatic assessment feedback (essay grading, programming error correction), virtual teaching assistants (24-hour question-and-answer support), and cross-disciplinary knowledge integration, promoting the transformation of education towards deep interaction. However, current research mainly focuses on general-purpose tools (such as ChatGPT), whose limitations are increasingly prominent: Training on Western corpora leads to insufficient adaptation to Chinese teaching scenarios. The weak embedding of subject knowledge bases and teaching logic undermines the support capacity in vertical fields. The uncontrollability of generated content is more likely to trigger academic integrity disputes, highlighting the deep contradiction between technological empowerment and educational value rationality.

2.2 Technical Characteristics and Educational Adaptability of DeepSeek

As a representative of domestic generative AI, DeepSeek has undergone multi-dimensional optimizations to its technical architecture based on general large models for educational scenarios:

Deep Adaptation to the Chinese Context: Trained on large-scale Chinese educational corpora (textbooks, academic papers, teaching cases), it significantly improves the understanding and generation accuracy of subject terms, supports flexible switching between multiple dialects and academic language styles, and meets the requirements of differentiated teaching.

Enhanced Logical Reasoning Ability: By simulating human problem-solving paths through the Chain-of-Thought technology and combining the knowledge retrieval enhancement (RAG) mechanism to call upon authoritative databases (such as CNKI, Springer) in real time, it effectively reduces the "hallucination" risk in high-level teaching tasks (such as mathematical proofs, experimental designs).

Multimodal Interaction Support: Integrating text, image, and code generation functions to adapt to the visualization teaching of STEM subjects and providing API interfaces to empower universities to develop customized private models. Compared

with general AI tools, DeepSeek's differentiated advantages lie in its role flexibility (serving as a teacher assistant, learning partner, and research collaborator) and the integration of educational theories, achieving deep synergy between technological tools and teaching methods and providing localized and specialized AI solutions for higher education scenarios.

2.3 Research Gaps and Breakthrough Directions

Although significant progress has been made in the research on the application of AI in education, the following areas still warrant in-depth exploration. Firstly, existing research mostly focuses on general-purpose AI tools, and empirical studies on vertical educational scenarios for localized and specialized models like DeepSeek are insufficient, restricting the precise adaptation of technological empowerment. Secondly, there is a lack of a systematic framework for the role division among teachers, students, and AI, and the ambiguity of human-machine collaboration mechanisms leads to the application of technology remaining at the surface level of tool substitution, failing to unleash the deep innovation of educational value. Thirdly, the academic usage boundaries of generative AI have not yet formed institutionalized consensus, and ethical norms such as citation rules, copyright ownership, and data privacy lag behind the speed of technological iteration, with potential risks continuously accumulating. These research gaps call for cross-disciplinary and multi-scale theoretical breakthroughs and practical validations to construct a path of coordinated development that combines technological efficiency and educational rationality.

3. Analysis of DeepSeek's Teaching Application Scenarios

The educational value of generative AI is not only reflected in technological advancement but also depends on its adaptability to teaching scenarios. Based on constructivist learning theory and the human-machine collaboration framework, this section deconstructs the role functions of DeepSeek in university classrooms from the perspectives of teachers, students, and research, revealing its mechanism for empowering teaching innovation.

3.1 As an Intelligent Lesson Preparation Assistant for Teachers: Dynamic Generation and Optimization of Teaching Resources

Throughout the "pre-class - in-class - post-class" process, DeepSeek reconstructs the teacher's lesson preparation mode through intelligent tools. Firstly, it automatically generates a subject knowledge graph based on course topic keywords to organize the logical structure of teaching content and simultaneously develops multimodal resources (such as a database of controversial legal cases, experimental animations), while integrating multilingual databases to provide localized materials for cross-cultural courses. Secondly, by analyzing the class ability distribution through learner profiling and combining Bloom's cognitive objective hierarchy (from memory to creation) to match stratified teaching activities (such as debates, project design), and predicting teaching difficulties (such as er-

ror rates in formula derivation) to optimize explanation strategies. Finally, by automatically generating a question bank and open-ended question scoring criteria based on the weight of knowledge points and constructing a learning effect prediction model to identify students' knowledge weak points, a closed-loop support system of "resource development - strategy design - assessment optimization" is formed, significantly improving the efficiency of lesson preparation and the accuracy of teaching.

3.2 As a Learning Partner for Students: Full Support for Personalized Learning Paths

DeepSeek, based on the "data perception - demand analysis - dynamic response" mechanism, builds a multi-level learning support system: In terms of personalized learning navigation, it diagnoses knowledge gaps (such as misunderstandings in probability calculation) to generate targeted remedial plans, recommends differentiated resources (videos/texts/interactive exercises) based on cognitive styles, and promotes metacognitive reflection through guided questioning; in the aspect of deep feedback and motivation, it uses Socratic dialogue to correct logical deviations, links complex problem-solving paths across disciplines (such as the socio-economic dimensions in climate modeling), and enhances learning motivation through gamification design; in addition, its collaborative learning empowerment module can achieve intelligent team division of labor, conflict resolution suggestions (based on emotion keyword analysis), and collaborative creation support, integrating multiple members' viewpoints to generate visual project prototypes, comprehensively optimizing individual learning and group collaboration efficiency.

3.3 As a Cross-disciplinary Research Collaborator: Incubator for Academic Innovation

In university research-oriented classrooms and research training, DeepSeek empowers academic innovation through three functional dimensions: Firstly, in the aspect of intelligent processing of academic literature, it generates frontier trend maps based on discipline keyword clustering, assists in the construction of literature review frameworks, and provides precise academic translation and expression polishing services; secondly, in the exploration of research method innovation, it can recommend mixed quantitative and qualitative method strategies based on research questions, support the generation of algorithm feasibility verification codes for engineering courses, and identify ethical risks in research design; thirdly, in the field of intelligent upgrading of academic communication, it strengthens students' defense capabilities by simulating peer review scenarios, converts text results into multimodal display forms (such as infographics, short videos), and builds cross-language academic collaboration bridges, helping students integrate into the global academic community.

3.4 Potential Challenges in Application Scenarios

Although DeepSeek shows broad application potential, its implementation needs to be cautious of certain risks. The weakening of teaching autonomy due to technological dependence: Teachers may overly trust AI-generated content, neglecting the subjective ini-

tiative in teaching design; the threat to educational equity from algorithmic bias: Models trained based on historical data may reinforce disciplinary stereotypes (such as "girls are not good at programming"); the gray area of academic integrity: When students use AI-generated literature reviews or codes, the standards for originality have not been unified.

4. Conclusion

This study deconstructed the triple roles of DeepSeek in university classrooms (teacher's intelligent assistant, student's learning partner, and research collaborator), revealing the core path of generative artificial intelligence empowering teaching innovation: through dynamic knowledge retrieval, adaptive feedback, and multimodal generation functions, it has restructured the intelligent practice of the entire "teaching-learning-research" process, providing technical support for personalized learning and interdisciplinary integration. However, the dual nature of technological tools cannot be ignored. Issues such as algorithmic bias, academic integrity disputes, and the technological dependence of teachers and students highlight the inherent conflict between educational value rationality and instrumental rationality. Although the short-term application of DeepSeek has demonstrated the potential to enhance teaching efficiency, its long-term impact needs to be carefully evaluated within a "technology-teaching-ethics" collaborative framework. Future research should further break through the limitations of disciplinary and regional samples, explore standardized paths for human-machine collaboration, and provide a Chinese solution that is both innovative and ethical for the digital transformation of higher education.

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