

The Impact of AI Large Language Models on Academic Education

Yifei Wang

Xi'an Technological University, Xi'an, Shaanxi, China

1310774954@qq.com

Abstract: With the explosive development of generative AI large language models represented by ChatGPT and DeepSeek, the field of academic education is undergoing unprecedented systemic transformation. This study aims to explore the dual impact of AI large language models as a "new intellectual medium" on traditional educational paradigms, academic ethics, and talent cultivation objectives. The research finds that, on the positive side, large models accelerate the universalization of educational resources and the improvement of teaching efficiency through personalized tutoring, interdisciplinary knowledge integration, and research assistance, breaking the limitations of traditional "standardized instruction" and promoting the transformation of education toward "human-machine collaborative" inquiry-based learning. However, on the negative side, the "black box" nature of large models and the inexplicability of generated content trigger academic integrity crises, weakening of students' critical thinking, and risks of knowledge dependence, while traditional outcome-oriented evaluation systems face challenges of obsolescence. The research further points out that the deep embedding of technology is forcing academic education to return to its ontological essence from "knowledge transmission" to "cognitive forging." Based on this, this paper proposes the construction of a "responsible AI education ecosystem," advocating for a balance between technological empowerment and educational essence through restructuring curriculum systems (strengthening prompt engineering and AI literacy), establishing dynamic academic integrity norms, and developing process-oriented evaluation mechanisms. The research shows that AI large models are not the terminators of education but catalysts. In the face of this cognitive revolution, academic education must embrace technological dividends while adhering to the subjectivity of human education, ultimately achieving a paradigm shift from "teaching knowledge" to "learning to question and innovate."

Keywords: AI Large Language Models; Generative Artificial Intelligence; Academic Education; Digitalization of Education; Human-Machine Collaboration; Academic Ethics

1. Introduction

1.1 Research Background

The global digital transformation of education has become a core strategy for addressing educational crises. The UNESCO monitoring report released in 2022 shows that more than 260 million children and adolescents worldwide are out of school, with the gap in educational resource investment between developing and developed countries reaching 20:1. The impact of the COVID-19 pandemic further exposed the structural vulnerabilities of traditional education systems in terms of technical infrastructure and adaptability, with approximately 150 million students worldwide forced to interrupt their learning due to a lack of digital devices. These data reveal a severe reality: traditional education models face insurmountable bottlenecks in resource allocation and personalized provision.

Meanwhile, generative artificial intelligence technology is breaking through technical boundaries at an unprecedented speed. Large language models represented by DeepSeek, utilizing mechanisms such as Multi-Head Latent Attention and Multi-Token Prediction, have significantly improved the coherence of text generation and computational efficiency. The maturity of such technologies has not only changed the way information is accessed but also substantially impacted the underlying logic of education systems. From personalized learning resource generation to intelligent tutoring system deployment, from instructional design assistance to learning diagnosis analysis, AI large models are penetrating the entire educational process.

1.2 Research Purpose and Significance

This study aims to systematically evaluate the mechanisms and effects of AI large models on academic education and, based on this, propose actionable paths for educational reform. Specifically, the research focuses on three core objectives: clarifying the current application status and effectiveness boundaries of AI large models in educational scenarios, identifying and classifying the educational risks triggered by technological applications, and constructing a framework for academic education reform adapted to the needs of the AI era. The scope of the study is limited to formal learning scenarios in K-12 basic education and higher education, focusing on general large models with text generation as their core capability.

The theoretical significance of the research is reflected in three aspects. First, the study enriches the theoretical framework of human-machine collaboration in the field of educational technology, introducing cognitive load theory and constructivist learning theory to propose a new explanatory model of "AI as a cognitive scaffold." Second, the research expands the boundaries of discussion on technological ethics, examining ethical issues within specific educational contexts. Third, the study integrates interdisciplinary perspectives, introducing methodologies from computer science, educational psychology, and public policy analysis into educational technology research. At the practical level, the findings of this study can provide decision-making bases for educational administrators, school leaders, and frontline teachers, as well as theoretical support for issues of educational equity in the intelligent era.

2. Current Development Status of AI Large Models in Education

2.1 Technical Foundations and Core Breakthroughs

The application of AI large models in education is built upon several key technological breakthroughs. The development of multimodal educational large models enables systems to achieve deep cross-modal integration of text, images, voice, and learning data, breaking the limitations of past single-modality instruction. Taking the EDU-PRIME educational large model developed by Tsinghua University as an example, this model adds a learning diagnosis module and a teaching strategy generation module to the traditional multimodal architecture. Using only one-eighth the training data volume of general models, it achieves a 28% improvement in student understanding accuracy compared to GPT-4o's education version in complex tasks such as explaining problem-solving approaches in K-12 teaching. The intelligent teaching agent architecture has completed an upgrade from a question-answering tool to a personalized learning companion. Through the combination of large language models and educational reinforcement learning, it forms a closed-loop teaching capability encompassing learning analysis, teaching planning, interactive execution, and effect feedback.

Breakthroughs in edge-side educational AI hardware provide computing power guarantees for technology popularize. Neuromorphic chips, using 3D stacking processes and education-scenario-specific computing scheduling algorithms, significantly increase computing power density while substantially reducing energy consumption while supporting core teaching functions such as real-time learning analysis and offline personalized exercise generation. Student tablets equipped with such chips can support eight consecutive hours of offline AI interactive learning, providing an accessible technical solution for remote areas with weak network infrastructure. The application of quantum edge computing technology has further optimized the efficiency of educational resource scheduling, significantly improving computing speed compared to traditional solutions in scenarios such as university library resource scheduling and school district teaching resource allocation.

2.2 Application Popularity and Market Landscape

In 2025, the global educational AI landscape formed a competitive pattern centered on China and the United States. The United States dominates the high-end market by virtue of its technological barrier in high-end educational chips and general educational large models. NVIDIA's education-specific chips account for 82% of the global high-end educational AI chip market. China builds its competitive advantages through open-source ecology and localized scenarios. The open-source educational model

launched by the DeepSeek team achieves performance close to international cutting-edge levels in scenarios such as code teaching and classical Chinese poetry explanation, with downloads exceeding 800,000, 60% of which are by primary and secondary school teachers and rural educators. Teachers can conduct secondary development based on this model to create teaching tools adapted to local textbooks, forming a unique development path driven by application innovation.

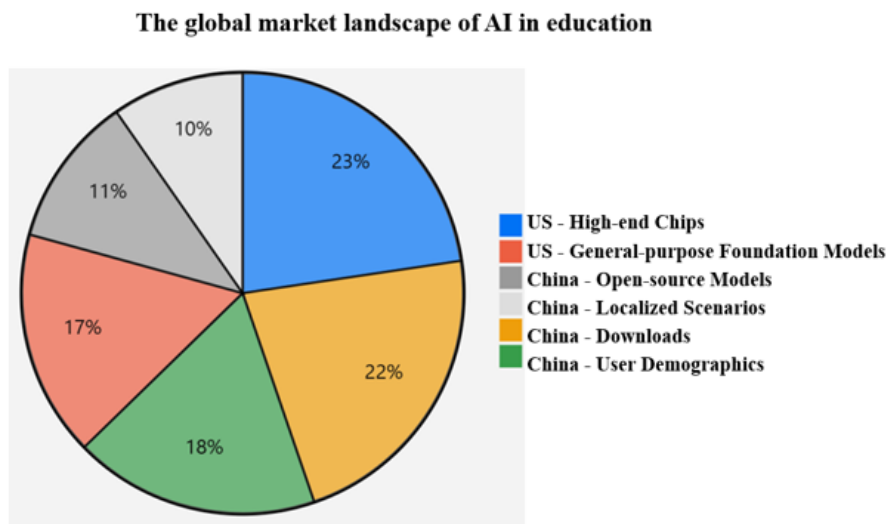


Figure 1. Global AI Development Landscape

The penetration rate of edge-side educational AI devices is experiencing explosive growth. Global shipments of AI education tablets reached 52 million units in 2025, an 85% increase from the previous year, with devices equipped with dedicated educational NPUs accounting for over 70%. The development of AI education PCs is also rapid. By locally deploying lightweight specialized educational models, they can support university students in completing tasks such as real-time code correction and rapid analysis of experimental data. The penetration rate of AI education PCs in global universities has exceeded 55%. The popularity of educational AI applications in China leads the world, with the user penetration rate of K-12 educational AI tools reaching 42%, 15 percentage points higher than the global average.

3. Applications and Impacts of AI Large Models on Academic Education

3.1 Personalized Learning and Instructional Design

The application of generative AI technology in the field of personalized learning breaks the limitations of traditional standardized education. Through multidimensional innovative applications, AI engines have broken through the static limits of traditional question banks, capable of dynamically generating ladder-style learning resources based on learners' cognitive levels, error patterns, and interest preferences. After collecting student learning data, the system uses machine learning algorithms to construct student models, based on which it recommends personalized course videos, learning materials, and exercises. When a student encounters difficulty with a particular concept, the system can automatically provide additional practice or alternative resources. When the student masters basic knowledge, the system can further provide more challenging tasks. This intelligent content ecosystem not only resolves the contradiction between standardization and personalization of educational resources but also improves the precision of learning resource matching by more than 40% compared to traditional methods.

In the field of instructional design, AI tools provide comprehensive teaching support for teachers. With intelligent tutoring tools represented by Khanmigo, teachers need only simply input core information such as course topics, target grades, and specific teaching objectives, and the system can quickly present a clearly structured lesson plan covering core teaching content, teaching activities,

and assessment methods. This intelligent function acts like an experienced teaching assistant, providing massive teaching resources including courseware, lesson plans, exercises, and test questions. Teachers can easily select and utilize these resources according to their individual teaching needs, without the need to search and filter through complicated online materials, thus saving significant lesson preparation time. Research data shows that teachers using AI lesson preparation systems reduce their average weekly lesson preparation time from 6.5 hours to 3.8 hours, a reduction of 42%.

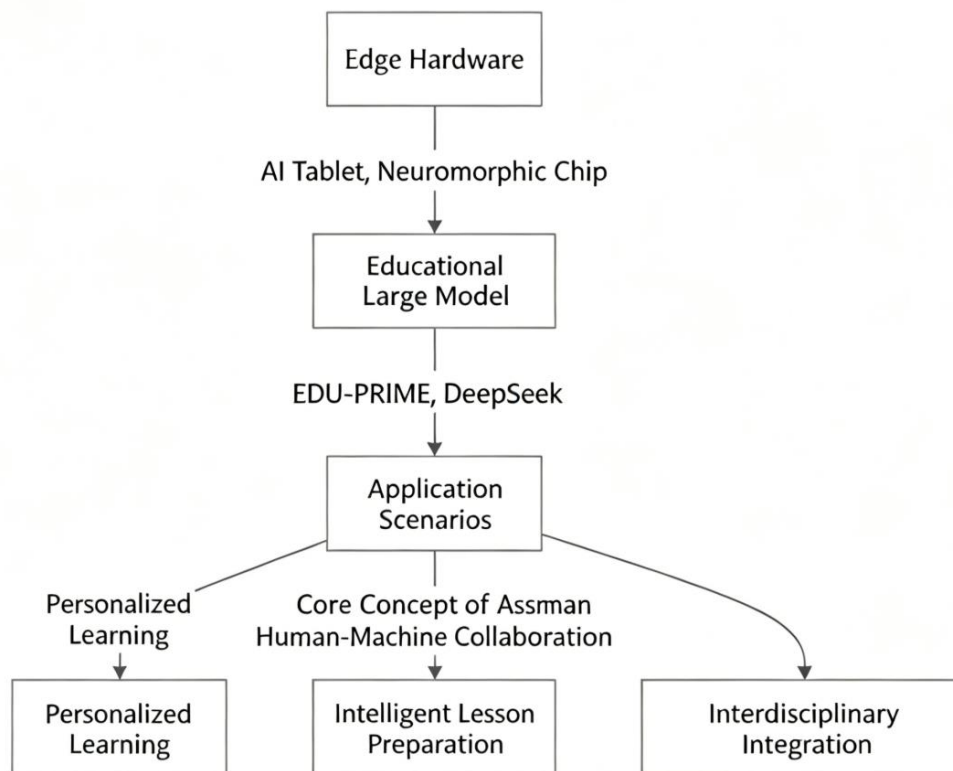


Figure 2. Application of AI Large Models in Education

3.2 Teaching Evaluation and Human-Machine Collaboration

Generative AI technology is redefining the paradigm of teaching evaluation. Based on natural language processing and knowledge graph technology, AI can analyze student classroom discussions, online collaborative documents, and experimental report texts in real time. Classroom speech analysis systems can automatically identify logical flaws in student responses, generate competence matrices covering dimensions such as critical thinking and argumentation quality, and visualize cognitive development trajectories. Essay evaluation engines can not only identify grammatical errors but also assess textual logic and depth of thought, generating guidance plans including rhetorical improvement suggestions and argumentation structure reorganization. These technological breakthroughs make it possible to shift teaching evaluation from outcome-oriented to process-oriented and developmental assessment.

The establishment of human-machine collaboration mechanisms is the core logic of AI-empowered education. The research identifies three typical integration models for teacher-AI collaboration. Tool-based integration accounts for the highest proportion, approximately 55%, where teachers use AI as an efficiency tool for tasks such as information retrieval and courseware creation. Collaborative integration accounts for 30%, where teachers and AI form a clear division of labor, with AI completing basic teaching tasks while teachers focus on higher-order thinking guidance and emotional support. Critical integration accounts for the lowest proportion, only 15%, where teachers actively identify and correct errors and biases in AI-generated content, incorporating technological critique into teaching content. This finding indicates that the key to technological empowerment lies

not in the equipment itself, but in the depth of teachers' integration of AI tools and their critical awareness.

3.3 Educational Equity and Interdisciplinary Ability Cultivation

Generative AI technology provides an innovative path for solving the problem of unequal distribution of educational resources. Rural educators can use intelligent education platforms to break through geographical spatial limitations and systematically access cutting-edge educational concepts and teaching methods. Through AI-assisted tools such as virtual teaching and research rooms and online course libraries, teachers can access high-quality teaching resources in real time and participate in cross-regional teaching discussions. This technological empowerment not only enriches teaching methods but also customizes teaching plans for each student through functions such as intelligent diagnosis systems and personalized learning path planning. Practice shows that the application of edge-side AI devices in remote areas increases the average math and English scores of rural school students by 20%, narrowing the score gap with urban schools by 15 percentage points, while reducing the time for teachers to access high-quality teaching resources from two hours to ten minutes.

In terms of interdisciplinary ability cultivation, generative AI demonstrates advantages that traditional education can hardly achieve. Through semantic understanding and knowledge graph technology, AI constructs dynamically restructured interdisciplinary cognitive networks, capable of breaking through artificially drawn disciplinary boundaries to achieve organic integration of knowledge across multiple fields. When explaining Renaissance history, the system can automatically associate the artistic presentation of scientific discoveries from the same period and generate AI painting creation tasks. This transformation of educational paradigm is essentially an evolution from static knowledge transmission to dynamic cognitive empowerment. Experimental data show that students using AI-assisted tools score 32% higher on interdisciplinary problem-solving ability assessments compared to the control group, providing a technical foundation for cultivating future talents with systems thinking and innovation capabilities.

4. Challenges in the Application of AI Large Models

4.1 Academic Integrity Crisis and Weakening of Critical Thinking

The deep application of AI large models in education has triggered a serious academic integrity crisis. The automated content generation capability of this technology may weaken the process of cultivating students' critical thinking and blur the boundary between knowledge acquisition and intelligent assistance. When technological tools are used to complete course papers or creative works, the traditional evaluation system faces the risk of disintegration. Research data shows that among students using AI assistance, approximately 27% admit to having used AI to complete assignments or papers without teacher authorization, a proportion that rises to 45% in online learning scenarios lacking effective supervision. More concerning is that some students are unaware that such behavior constitutes academic misconduct, defending their actions with the argument that AI is a tool, a cognitive deviation that reflects the crisis of explanatory power faced by traditional academic norm systems in the intelligent era.

Time-series analysis of platform log data reveals a trend worth noting. As the duration of AI assistance use extends, students' independent problem-solving accuracy in situations without AI help shows an inverted U-shaped curve, rising first and then falling, reaching a peak after about three months of use and then slowly declining. This indicates that long-term reliance on AI may produce a "cognitive crutch effect," where students' independent thinking abilities, after being temporarily improved with technical support, are gradually eroded. From the perspective of cognitive load theory, appropriate cognitive effort is a necessary condition for deep learning to occur. AI systems break down complex problems into easily digestible steps, reducing immediate cognitive load but also depriving students of opportunities for strategic thinking and trial and error, preventing them from internalizing the problem-solving thinking framework.

4.2 Algorithmic Bias and Data Privacy Risks

The problem of algorithmic bias, while existing in actual operation, has a more subtle impact than expected. The research identifies a "cumulative advantage effect," where students with stronger initial learning abilities receive more advanced resources from AI recommendation systems, while students with learning difficulties are continuously pushed basic content. This adaptive mechanism based on historical performance, while optimizing individual learning efficiency, may also solidify existing ability stratification. When the system continuously pushes challenging content to advantaged students and basic exercises to struggling students, the former achieve faster growth rates while the latter remain trapped in catch-up mode, thus continuously widening the gap. This is not the algorithm's intention, but it is the algorithm's consequence. Structural imbalances in training data may lead models to copy or even magnify social biases along dimensions such as gender, race, and geography. This technical discrimination has concealed characteristics, achieving systematic exclusion through seemingly neutral decision-making mechanisms.

Data privacy and security constitute another prominent risk. The deep application of AI technology requires the collection of multidimensional learning behavior data, covering sensitive information such as knowledge mastery levels, cognitive style preferences, and personalized learning trajectories. The full lifecycle management of this data involves multiple links including collection, storage, transmission, and analysis. Surveys show that only 38% of surveyed students and parents clearly know the purpose and storage method of their data. Some educational technology companies' data use agreements contain vague clauses allowing anonymized data to be used for algorithm training, leaving compliance risks for secondary use of data. Without strict data governance mechanisms, this may lead to unauthorized access, data leakage, or misuse risks, seriously damaging student rights and undermining the foundation of educational trust.

4.3 Teacher Role Dilemmas and Insufficient Technical Infrastructure

Teacher training faces structural challenges. The contradiction between accelerating technological iteration and educational lag causes teachers' efforts to improve their AI literacy to fall into a "catch-up dilemma." The technological evolution of generative AI follows Moore's Law, while teacher training systems are constrained by the cycle of educational resource allocation, creating a significant developmental time lag. This difference in the speed of knowledge renewal means that some teachers, before they have mastered current technology, must already replied the teaching application needs of next-generation tools. Research data shows that more than half of teachers, when initially exposed to generative AI, tend to simply superimpose technological tools onto traditional teaching, reflecting the difficulty of educational paradigm transformation. Teachers may worry that AI will replace their teaching roles. This anxiety is particularly common in the early stages of technology introduction, with approximately 68% of surveyed teachers expressing varying degrees of anxiety.

Insufficient technical infrastructure limits the widespread promotion of AI technology. Effective implementation of AI in education requires thorough technical infrastructure, including high-speed internet, cloud computing platforms, and sufficient data storage and processing capabilities. However, in some regions or schools, weak infrastructure and insufficient technical resources are major obstacles. In 2025, the penetration rate of AI education PCs in universities in eastern China reached 90%, while in western China it was only 45%. Globally, the penetration rate of educational AI hardware in developed countries is 70%, while in developing countries it is only 25%, and in some African countries even below 10%. This hardware gap directly leads to differences in the ability to access educational resources and may exacerbate rather than alleviate global educational inequality.

5 Countermeasures for Academic Education in the AI Era

5.1 Curriculum System Restructuring and AI Literacy Cultivation

To respond to educational transformation in the AI era, curriculum system restructuring becomes the primary task. AI literacy should be incorporated into core teaching objectives, cultivating students' critical evaluation capabilities regarding AI-generated content. Specifically, a special module on human-machine collaboration can be added to information technology courses to help students

understand the capability boundaries and limitations of AI. Training in the analysis and authentication of AI texts can be embedded in disciplines such as Chinese language and history, enabling students to master basic methods for identifying AI-generated content. The key to this curriculum design is not simply teaching the use of AI tools as course content, but cultivating students' reflective awareness and critical attitude toward technological products.

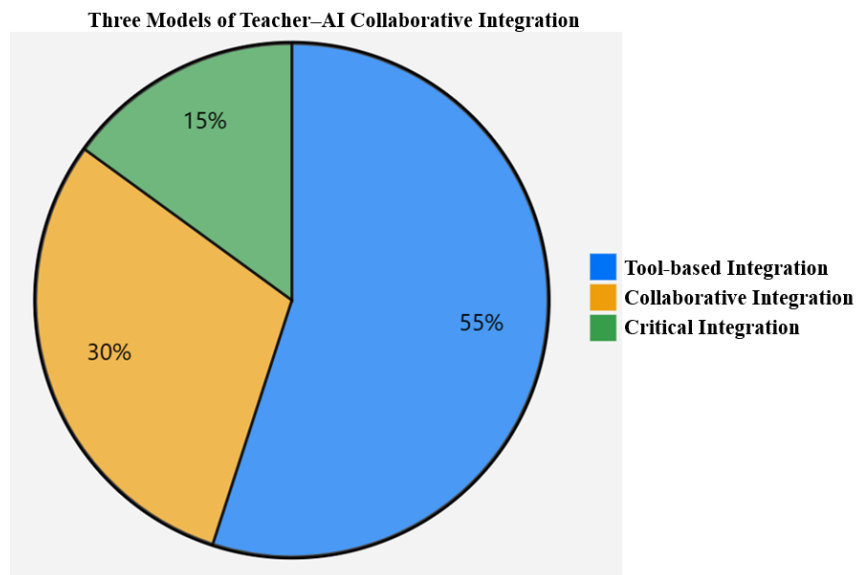


Figure 3. Proportion Chart of Teacher Collaboration Models

Another direction for curriculum integration is to strengthen the systematic construction of disciplinary knowledge. Traditional teaching methods often present knowledge points in a fragmented manner, making it difficult for students to establish a complete knowledge framework. In the AI era, curriculum design should consider how to leverage the knowledge association capabilities of large models to help students build structured cognitive frameworks. When explaining network topology structures, it is necessary not only to introduce the characteristics of traditional topologies but also to guide students to analyze the selection basis, performance optimization key points, and fault response strategies in different scenarios in conjunction with actual network engineering cases, allowing students to understand the internal connections between knowledge points and learn to plan solutions from a holistic perspective. At the same time, the proportion of practical teaching should be significantly increased, designing practical projects that cover the entire process of knowledge application to ensure that students can quickly adapt to work demands in related fields after graduation.

5.2 Teacher Professional Development and Role Transformation

Teacher training systems need to shift from tool operation to educational paradigm transformation. In response to the current phenomenon of differentiation in teachers' integration abilities, a layered training system should be established, progressing from tool-based application to collaborative integration to critical integration, helping teachers achieve capacity advancement. Tool-based training focuses on the basic operation of AI tools and teaching scenario application, enabling teachers to skillfully use functions such as intelligent lesson preparation and automatic question generation. Collaborative training emphasizes the division of labor and collaboration between teachers and AI, helping teachers understand the cognitive characteristics and capability boundaries of AI, learning to delegate basic teaching tasks to AI while focusing themselves on higher-order thinking guidance and emotional support. Critical training cultivates teachers' ability to scrutinize and correct AI-generated content, integrating technological critique into the teaching process.

Subject-embedded training design should become the direction of reform. Research finds that humanities teaching places more emphasis on text interpretation and value judgment, with teachers tending to position AI as a material provider while retaining core interpretive authority. Science and engineering teaching, on the other hand, relies more on logical deduction and problem-solving, with

teachers more easily accepting AI as a cognitive partner. Therefore, the training content for humanities teachers and science/engineering teachers should be designed separately, with humanities focusing on the analysis and authentication of AI texts, and science/engineering focusing on strategy design for AI-assisted problem-solving. In addition, schools should incorporate AI teaching capabilities into teacher professional development evaluation systems, establish sustainable learning communities, and promote teachers' regular learning through peer assistance and case studies.

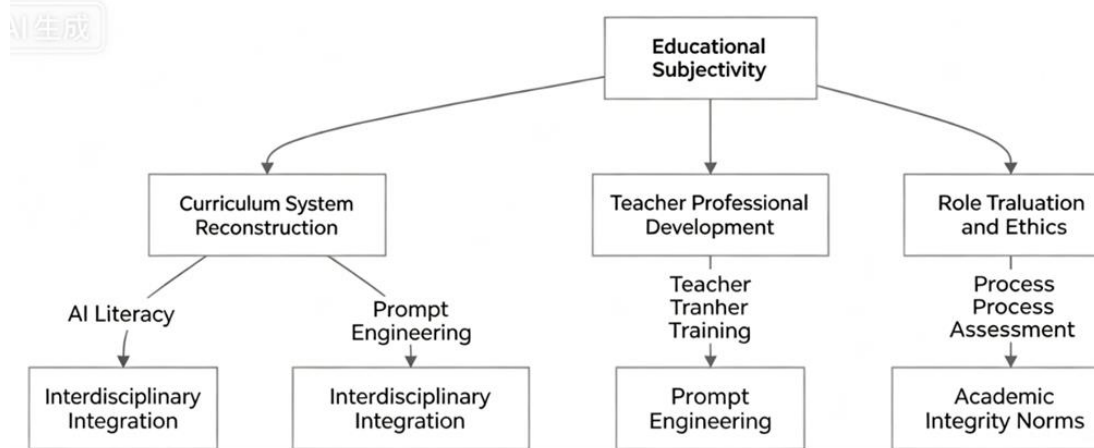


Figure 4. Artificial Intelligence Education Ecosystem Framework

5.3 Evaluation Mechanism Innovation and Ethical Norm Construction

The teaching evaluation system needs to shift from outcome-oriented to process-oriented assessment. Traditional evaluation methods dominated by closed-book examinations face the risk of obsolescence in the AI era, as students can use AI tools to complete assessment tasks that were originally required to be completed independently. The coping strategy is to increase the proportion of manual evaluation links such as oral defenses, practical operations, and classroom participation, reducing the proportion of AI-substitutable assessments. In terms of evaluation indicators, critical thinking, innovation ability, and information literacy should be incorporated into the assessment scope, so that evaluation truly reflects students' comprehensive abilities rather than the level of simple knowledge memorization. Assessment of theoretical knowledge can be conducted in dispersion form through periodic quizzes, classroom interactive Q&A, etc., avoiding a single final examination that determines everything.

Academic integrity norms need to be updated simultaneously at the technical and institutional levels. At the technical level, AI-generated content detection tools should be deployed to establish mechanisms for identifying and tracing academic misconduct. Digital watermarking technology can embed invisible identifiers in AI-generated teaching content, maintaining a high level of identification accuracy even after format conversion or content editing. At the institutional level, schools should formulate clear norms for AI use, defining which learning tasks are suitable for human-machine collaboration and which tasks should remain Independent artificial intelligence. It is recommended to use Bloom's Taxonomy of Educational Objectives as a defined tool: memory and comprehension tasks can moderately in virtue of AI, application and analysis tasks should limit the degree of AI intervention, and evaluation and creation tasks should be primarily completed manually. At the same time, students' awareness of academic ethics should be strengthened through orientation education and course teaching, enabling them to understand the essential requirements of academic integrity rather than merely rest on rule compliance.

The construction of an ethical governance framework needs to proceed from multiple dimensions. Establish interpretable transparent algorithms at the technical level, with bias detection and correction modules. Formulate ethical review standards at the institutional level, defining restricted zone for technology application. Reshape the training paradigm of human-machine collaboration at the educational philosophy level, emphasizing the value complementarity of technical tools and human wisdom. Educational technology enterprises should be required to provide interpretable explanations of algorithmic recommendation logic and establish regular algorithm audit mechanisms. Government

departments are advised to establish a tiered filing system for educational AI applications, implementing mandatory compliance assessments for high-risk scenarios such as college entrance examination AI scoring and K-12 core subject intelligent teaching agents, while clarifying data ownership affiliation and usage boundaries to achieve traceable management of data roam.

6. Conclusion and Outlook

6.1 Research Conclusions

This study systematically explores the impact mechanisms and response paths of AI large models on academic education, revealing the dual effects of technological empowerment and cognitive risks. On the positive side, AI large models demonstrate significant advantages in personalized learning resource generation, instructional design assistance, and automated evaluation. Practice at a certain university shows that the AI teaching assistant system reduced teacher lesson preparation time by more than 40%, and student standardized test scores improved by approximately 11 percentage points. The application of edge-side AI devices in remote areas increased rural school students' scores by 20%, narrowing the gap with urban schools by 15 percentage points. In terms of interdisciplinary ability cultivation, AI assistance increased students' interdisciplinary problem-solving ability scores by 32%. These data indicate that AI large models do have the potential to promote educational efficiency improvement and equity enhancement.

Table 1 Overview of Core Impacts of AI Large Language Models on Academic Education

Dimension	Positive Impacts	Major Risks	Countermeasures
Teaching & Learning	Personalized resource generation; 42% increase in lesson preparation efficiency	Weakening of critical thinking; cognitive crutch effect	Restructuring curriculum; enhancing AI literacy cultivation
Assessment & Integrity	Process-oriented assessment becomes possible	Academic integrity crisis (27% of students unauthorized AI use)	Dynamic academic norms; AI-generated content detection
Teacher Role	Reduction in lesson preparation burden	Role anxiety (68%); technology catch-up dilemma	Layered training (tool-based → collaborative → critical)
Equity & Ethics	20% score improvement in rural students; 15% narrowing of urban-rural gap	Algorithmic bias; data privacy risks; hardware divide	Explainable AI; data governance; tiered compliance assessment

However, the risks identified by the research are equally cannot be ignored. In terms of academic integrity, approximately 27% of students admitted to using AI to complete assignments without authorization. The cognitive crutch effect warns that long-term reliance on AI may gradually erode students' independent thinking abilities. The cumulative advantage effect of algorithmic bias shows that adaptive recommendation systems, while optimizing efficiency, may solidify existing ability stratification. The phenomenon of teacher role become divided shows that most teachers remain at the tool-based integration stage, with low proportions of collaborative and critical integration. These findings challenge the optimistic expectations of technological determinism, emphasizing that the effects of technology application are not determined by technology itself but are embedded in specific educational contexts, organizational cultures, and institutional arrangements.

6.2 Future Outlook

Looking ahead, AI large models will evolve in the direction of smarter technology, deeper application, and more coordinated governance, upgrading from educational assistance tools to human-machine collaborative enhanced educational partners. At the technical level, with the cross-integration of brain

science and AI, educational large models will further achieve educational cognitive simulation, significantly reducing teaching hallucinations and improving the precision of personalized teaching. Breakthroughs in green computing power and new energy storage technologies will solve energy consumption problems, promoting the low-carbon development of educational AI. The deep integration of multimodal technology with cutting-edge technologies such as the metaverse and brain-computer interfaces will enable educational scenarios to break through physical limitations and build a learning environment integrating the virtual and the real.

At the application level, educational AI will move from single-point pilot projects to large-scale universal access. Through the dual-wheel drive of digital infrastructure and educational AI, regional educational gaps will continue to narrow, achieving a leap from basic balance to high-quality balance. AI will play a core role in scenarios such as interdisciplinary teaching, innovation ability cultivation, and lifelong learning services. Teachers' functions will shift from knowledge transmission to emotional guidance and innovation stimulation. Through a dual-track training model of AI literacy and educational innovation, teachers will master human-machine collaboration strategies. Immersive simulation classrooms and AI collaborative design tools will help teachers reply complex teaching situations.

At the governance level, a framework combining unify basic principles and flexible regional rules will take shape. The three models of the EU's risk-graded strict regulation, China's classified regulation and territorial management, and the US's industry self-regulation and market-driven approach will seek synergy amid differences. Industry self-regulation and third-party evaluation mechanisms will be further improved, reducing compliance costs for small and medium-sized enterprises. Dynamic ethical review mechanisms and transparency practices in open-source communities will ensure the fairness and inclusiveness of AI systems, eliminating educational inequality from the technical foundation. In the next decade, AI large models will profoundly reshape the education supply model and learning ecosystem. Their healthy development depends on the synergistic advancement of technological innovation, ethical constraints, and social consensus. Only by placing the instrumental rationality of technology under the humanistic care of education can AI truly become a positive force for educational progress, ultimately achieving the fundamental goal of enabling every learner to enjoy fair and quality education.

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