Journal of Contemporary Educational Research, 2026, Volume 10, Issue 5
http://ojs.bbwpublisher.com/index.php/JCER
Online ISSN: 2208-8474
Print ISSN: 2208-8466

Research on the Development of Computer Education Driven by the Dual Wheels of "Knowledge Graph + Large Model" Based on Literature Analysis

Ling Tu

Anhui Institute of Information Technology, Wuhu 241199, Anhui, China

Abstract: *Objective:* To explore the development path of computer education driven by the dual wheels of knowledge graph and large model, and provide theoretical references for technological iteration and method innovation. *Methods:* Through literature combing, analyze the application status, empowering value, and limitations of large models in computer education, and propose a collaborative development framework combined with the technical characteristics of knowledge graphs. *Results and Conclusion:* The integration of knowledge graphs and large models can reshape the innovative ecology of computer education, forming new breakthroughs in fields such as interdisciplinary resource development, dynamic knowledge graph construction, and human-machine collaborative intelligent teaching.

Keywords: Computer education; Knowledge graph; Large model; Literature analysis; Intelligent teaching

Online publication: June 12, 2026

1. Introduction

Policies such as the *New Generation Artificial Intelligence Development Plan*, *the 14th Five-Year Plan for Digital Economy Development*, and the *Education Power Construction Plan Outline (2024–2035)* clearly promote the in-depth integration of computer education with artificial intelligence and big data technologies, which has become a key path for cultivating top innovative talents in the digital age.

Since McCarthy proposed the concept of artificial intelligence in 1956, the technology has gradually moved from laboratories to industries. As a core product in the field of AI deep learning, Large Language Models (LLMs) have injected momentum into educational transformation with their generation and interaction capabilities. However, problems such as "hallucinations" and insufficient domain knowledge restrict their in-depth application in the field of computer education, which requires high accuracy [1]. Google proposed knowledge graphs in 2012, with triples G = (E,R,S) as the core, constructing a knowledge network through the structured representation of entities and relationships, which can ensure the accuracy of teaching information and reduce misinformation from large models.

The in-depth integration of knowledge graphs and large models can form a dual support of “knowledge accuracy guarantee + intelligent interaction empowerment,” becoming the core direction of technological innovation in computer education. This study sorts out the application status of large models, proposes paths for knowledge graphs to enhance the reasoning ability of large models, and provides references for the development of computer education.

2. Application status of large models in the field of computer education

2.1. Literature retrieval and screening

This study retrieved literature from January 2018 to January 2026 using “large model,” “large language model,” and “computer education” as keywords from three core databases: CNKI, Wanfang, and VIP. Initially, 271 papers were obtained. After four-stage screening in accordance with the PRISMA-2020 guidelines, 30 core literatures were finally retained to provide data support for the research (**Figure 1**).

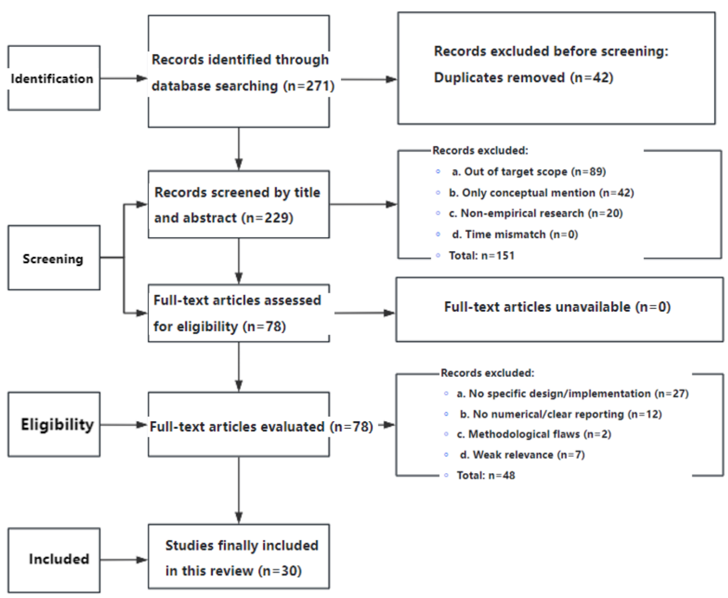

Figure 1. Literature screening process

2.2. Core application scenarios

Large models have been deeply integrated into the entire chain of higher computer education, with main application scenarios as shown in **Table 1** [2–14].

Table 1. Main application scenarios of large models in higher computer education

Application scenario	Specific application examples
Intelligent Teaching Assistance and Personalized Q&A	Course intelligent Q&A assistant, intelligent tutoring system, automatic Q&A, learning partner
Programming Teaching and Code-Related Applications	Code generation and explanation, programming debugging assistance, automatic code grading, software engineering practice assistance
Personalized Learning Paths and Resource Recommendation	Adaptive learning system construction, personalized learning path planning, intelligent recommendation of learning resources
Intelligent Construction of Course Resources and Knowledge Systems	Intelligent lesson plan/case generation, construction, and enhancement of course knowledge graphs
Learning Assessment and Academic Analysis	Automatic homework grading and feedback, learning behavior analysis, academic performance prediction
Exploration of Teaching Model and Curriculum System Reform	Innovation of blended/intelligent teaching models, curriculum system reconstruction, teacher competence development framework

2.3. Application challenges

2.3.1. Model reliability and "hallucinations"

The "hallucinations" and insufficient factual accuracy of large models are core technical bottlenecks in educational applications. Although technologies such as RAG (Retrieval-Augmented Generation) and post-retrieval reflection can alleviate this problem, the reliability of answers in complex computer technology Q&A is still difficult to guarantee, affecting knowledge mastery and teaching credibility [1].

2.3.2. Student competence cultivation and dependence risk

Large models are prone to causing students to over-rely on them, weakening their ability to independently solve complex programming problems, which is contrary to the core goal of computer education to cultivate engineering practice capabilities [15].

2.3.3. Academic integrity and assessment reconstruction

The generation ability of large models has intensified homework plagiarism and code ghostwriting, reducing the effectiveness of traditional assessment methods. It is necessary to reconstruct assessment systems such as process-oriented evaluation and project assessment [15].

2.3.4. Digital divide and resource equity

The application of large models has higher requirements for the technical facilities of colleges and universities and the digital literacy of teachers, which is likely to exacerbate the imbalance in the distribution of educational resources and form transformation pressure on resource-weak colleges and universities and teachers and students [15].

2.3.5. Data security and privacy

The application of large models involves students' personal information and learning behavior data. Cloud API services have risks of data leakage and abuse, and there is currently a lack of mature security and privacy protection frameworks [1].

3. Innovative directions of computer education driven by the dual wheels of "knowledge graph + large model"

To systematically solve the above limitations, a new educational paradigm of "knowledge graph-enhanced large model" is proposed. This paradigm is not a simple superposition, but forms a collaborative system of "symbolic knowledge as the foundation and generative intelligence as the application" through deep coupling. Its core architecture is shown in **Figure 2**.

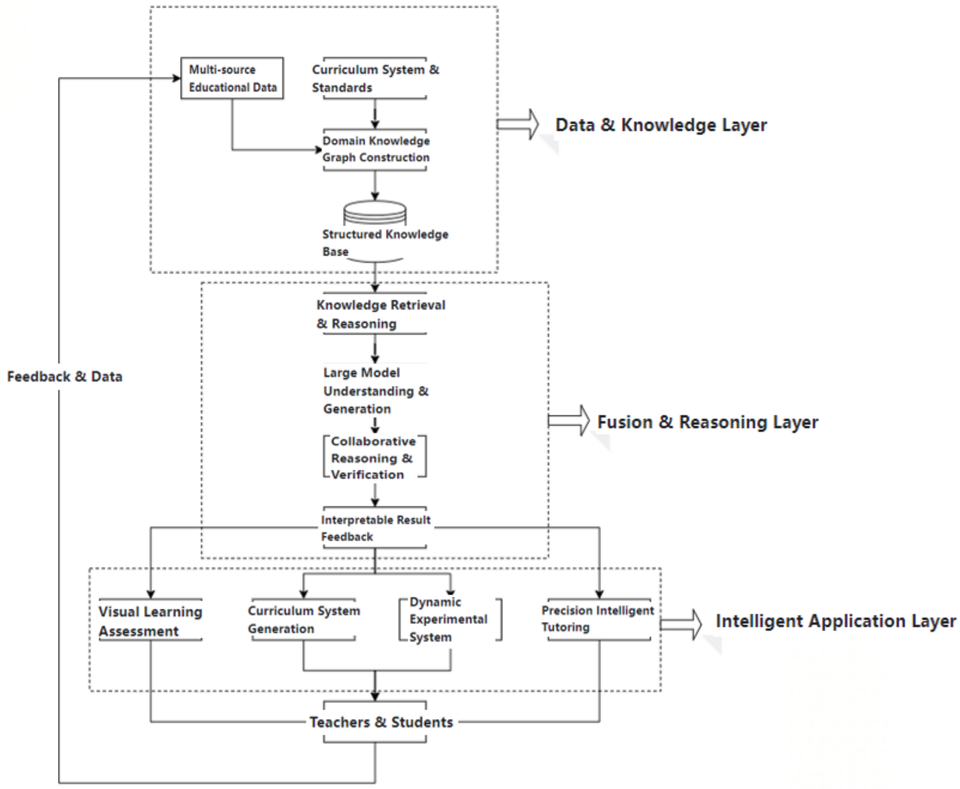

Figure 2. New paradigm of computer education combining knowledge graph and large model

3.1. Technical layer: Construction of dynamic knowledge graphs and collaborative reasoning

Taking RAG as the core, use knowledge graphs as external knowledge bases to retrieve relevant knowledge points before generating answers, suppressing "hallucinations" from the source; construct dynamic knowledge graphs, automatically extract entities and relationships based on multi-source data such as textbooks, papers, and open-source code, and update cutting-edge disciplinary knowledge in real time; transform the black-box reasoning of large models into knowledge graph symbolic reasoning chains, realizing traceable and correctable reasoning processes [9].

3.2. Teaching layer: Reshaping intelligent teaching experience

Create a "knowledge graph + large model" course Q&A assistant to accurately answer technical questions and display knowledge point associations; knowledge graphs store programming syntax and algorithm principles, while large models generate interpretable code examples and debugging schemes to achieve accurate code scoring and feedback; construct student knowledge mastery portraits based on knowledge graphs, and analyze learning behaviors combined with large models to plan personalized learning paths; large models assist in generating lesson plans, and knowledge graphs conduct structured verification to build a high-quality course resource library; design assessment question banks with knowledge graphs, and combine large models to achieve intelligent grading and ability diagnosis, innovating academic evaluation [9].

3.3. Ecological layer: Evolution of human-machine collaborative paradigms

Teachers' roles shift from knowledge instructors to learning designers and AI coaches, designing inquiry-based learning tasks; students change from passive recipients to active inquirers, cultivating critical thinking with the help of large models and knowledge graphs; build a collaborative ecosystem of "knowledge graph + large model + open-source community + school-enterprise cooperation" to promote the inclusive and high-quality development of computer education [10].

4. Conclusion

Through literature analysis, this study sorts out the application status and challenges of large models in computer education, demonstrates the complementary value of knowledge graphs to large models, and proposes a dual-wheel-driven development framework. In the future, the in-depth integration of knowledge graphs and large models will form breakthroughs in fields such as dynamic knowledge graphs, human-machine collaborative teaching, and personalized assessment, providing core technical support for computer talent training in the AI era.

Disclosure statement

The author declares no conflict of interest.

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