Advances in Educational Technology and Psychology (2026)
Clausius Scientific Press, Canada
DOI: 10.23977/aetp.2026.100301
ISSN 2371-9400 Vol. 10 Num. 3

Application Practices of Generative Artificial Intelligence in Primary School Information Technology Education

Wang Meng

Zhonghaicheng Primary School of Shenyang Experimental School, Shenyang, Liaoning, China

Keywords: Generative Artificial Intelligence; Primary School Information Technology Education; Human–AI Collaboration; Teaching Strategies

Abstract: GenAI has led to more opportunities to enable competency based learning in information technology education of primary schools. The application to the classroom is complicated with cognitive adaptation, teacher competence and a reconstruction of instructional interactions. Based on different factors such as curriculum goals, technology, and current real world situations, we consider critical obstacles such as both mismatch between technology and students cognitive development, teachers' leadership, and lack of control over AI content. We propose practical solutions, such as a hierarchical human–AI collaborative teaching model, an appropriate intervention pathway based on core disciplinary concepts, and a dynamic regulation system based on triadic interaction. We show that effective transformation from technology potential to education can only be performed by establishing a systematic implementation pathway that focuses on children cognitive development and supported by teachers' tutoring. Our results provide theoretical guidelines for advancing information technology learning in basic education in the face of artificial intelligence.

1. Introduction

With the proliferation and popularity of the large language models ChatGPT and DeepSeek, generative AI has entered society at an unprecedented pace with massive change and restructuring in education. In basic education, information technology courses of primary schools, due to their inherent disciplinary characteristics and the sensitivity to technological innovation, open an interesting area for exploring deep integration of AI and teaching. However, theory/practicing gaps still exist between theory and practice. On one hand, the competency oriented shift of curriculum standards has provided a natural desire for intelligent technologies. On the other hand, cases like overuse of technologies, deviance from instructional objectives, and disorder in assessment practices of frontline teaching show that transplanting general purpose AI tools to classrooms cannot necessarily produce desirable learning outcomes[1]. Against this background, in this paper, this paper is based on a realistic scenario of primary school information technology education and discusses the problem from three angles: practical background, existing challenges, and implementation. The aim is to clarify the reasoning behind deep integration (genetics) of generative artificial intelligence and primary school ICS teaching and provide a theoretical and practical road map which can serve as useful reference for frontline teaching.

2. Practical Foundations for the Integration of Generative Artificial Intelligence into Primary School Information Technology Education

2.1 Iteration of Curriculum Objectives and the Competency-Oriented Transformation of Primary School Information Technology Education

In recent years, since the adoption of the Information Technology Curriculum Standards for Compulsory Education (2022), primary school information technology education has begun moving from skill learning to core skills. Course objectives pursue not only software operation and basic programming skills, but are dedicated to cultivating four core competencies, and these four competencies cover information awareness, computational thinking, digital learning and innovation, and also include responsibility in information society. Classroom teaching cannot simply stay at one-way demonstration, but must create real problem-solving environments, enabling students to understand nature and methods of information technology through learning, while competency-based teaching emphasizes internalized thinking and personalized learning paths, as well as diversification of problem-solving methods. These learning needs naturally stimulate interest in generative AI, which provides instant feedback, multimodal content generation and conversational interaction functions, and can serve as technical means for establishing competency-oriented educational goals[2].

2.2 Technical Characteristics of Generative Artificial Intelligence and Its Educational Applicability

Generative AI has a high-level capabilities including natural language understanding and generation, cross-modal content creation, reasoning and code generation. The most remarkable aspect of generative AI is that it generates context-sensitive and creative outputs based on users' open-ended instructions. From an educational perspective, generative AF presents three key opportunities in primary school information technology classrooms: 1) It transforms abstract algorithmic logic and data-processing into visual explanations and graphical examples to lower cognitive barriers for teachers[3], 2) It supports inquiry learning by multi-turn discussion to make students gradually refine their knowledge by questioning, feedback and re-training—an approach related to development of computational thinking; 3) It automatically generates different learning material and programming examples to lay the foundations for students' personalized learning and creative projects. However, technological accessibility does not always translate into educational performance. The value of generated AI depends on teachers to interpret the instructional context and integrate technological tools into teaching. The idea is the starting point for subsequent implementation.

2.3 Accumulated Experience with Intelligent Technologies in Primary School Information Technology Classrooms

Though generative AI can be widely applied in basic education without much effort, many teachers already received an experience with smart technologies. For intelligent tutoring, some schools have proposed adaptive learning frameworks and AI-powered question-answering, while others have provided programming help by timely response to students' problems and intelligent diagnosis of coding errors[4]. In creative project development, teachers used intelligent prompting functions embedded in visual programming tools to guide students from idea generation to code implementation. In assessment and feedback, few classrooms have begun to experiment with

intelligent evaluation tools that quickly evaluates students‘ digital products and propose better improvement. Although this has not fully revealed the capabilities of generative AI, they have exposed the basic forms in which intelligent technology can be introduced in information technology education and the practical problems the implementation may face. These experiences provide local insight for future development, but also call for urgent needs in teacher training, technology selection, and curriculum redesign.

3. Key Challenges in Applying Generative Artificial Intelligence to Primary School Information Technology Education

3.1 Misalignment Between Technological Tools and the Cognitive Development Levels of Young Learners

Most generic AI platforms aim at mature languages and abstract reasoning. Their design architectures and interaction mechanisms (e.g. voice, prompt engineering, and input generated output) require relatively advanced reading comprehension, reasoning, and critical evaluation abilities, while primary school students often move between concrete operations and formal operations. They still need information filtering and metacognitive control. When technology requires children to formulate problems using exact and structured language, check whether or not produced responses are valid, and independently modify their questions, the cognitive requirements may exceed their capabilities of development. These technologies, therefore, are a “showcase platform” for a small class of high-achieving students, not a learning scaffold available to all students[5]. Furthermore, most generative AI platforms lack child friendly design features such as simple interface, voice, and visual aids for younger users. This adds to the tension between technological rationality and children's cognitive features, making it hard to achieve social and inclusive technology-enabled learning.

3.2 Risks of Diminished Teacher Leadership Resulting from Insufficient AI Literacy

Introducing generative AI to classroom learning places teachers from knowledge transmitters to learning helpers and technology users on a very challenging level.Teachers must understand general principles and limitations of generative artificial intelligence, have the experience of designing useful prompts, testing the accuracy of AI-generated speech, and seamlessly incorporating intelligent tools into the school. However, the percentage of primary school information technology teachers who received systematic AI training is not high. Many teachers do not regard generativeAI as an “advanced search engine” or “chatbot” without developing a teaching environment to make it a useful tool. In practice, such competition arises in two opposite regimes: 1) The teachers that rely heavily on technology. Teachers give up teaching authority to smart systems and classrooms become loosely organized human–machine interactions. 2) The teacher is overly resistant to technology. The teachers do little experimentation, not knowing AI tools and who are uncertain how valuable they are to them, and become an abstract classroom ornament. Both regimes diminish the importance of teachers as leaders and designers of the course of learning.

3.3 Loss of Control Over Generated Content and Assessment Challenges in Reconstructed Classroom Interaction Models

Introducing generative AI into information technology classrooms erodes the linear learning

model of “teacher–student-experience–uniform feedback”.It becomes an open learning environment that includes multi-turn human–AI discussions and personalized learning resources.Although this brings new opportunities, it also introduces issues of content controllability and assessment validity.On the content level, AI-generated texts, code and images are highly dynamic and unpredictable.The same query can produce much different—or even contradictory—responses in different settings.Those may be factual error, logical error, or presentation methods that are inappropriate for primary school students.Due to real-time environment of classroom conversations, teachers can usually recognize and correct them immediately.On top of that, traditional information technology education has traditionally been based on tasks completion and correctness.As generativeAI comes into use, students' learning becomes extremely connected to AI.Teachers may not distinguish between outcomes reflecting students' independent thinking and abilities and results largely generated by AI systems, raising questions regarding authenticity of formative assessment and fairness of summative assessment.There is therefore a pressing need for a new assessment framework that can accommodate emerging patterns in human–aural interaction and accurately capture students' real learning and developmental results.

4. Practical Strategies for Empowering Primary School Information Technology Education Through Generative Artificial Intelligence

4.1 Building a hierarchical human-machine collaborative teaching framework based on children's cognitive ladder

Addressing misalignment between technical tools and children's cognitive development level, core lies in taking children's cognitive ladder as underlying logic, constructing hierarchical human-machine collaborative teaching framework, with the theoretical foundation of this framework originating from Vygotsky's 'zone of proximal development' theory, which emphasizes that degree of intelligent tool intervention should be dynamically adjusted as students' cognitive abilities grow, rather than rigidly applying same interaction mode. This framework divides application of intelligent tools in primary school information technology classrooms into three progressive levels, with each level forming orderly gradient relationships across four dimensions: teacher role, student role, tool functions and interaction depth. .In the lower grades, students' logical abstraction ability is still in its infancy, and concrete thinking still dominates. Therefore, teachers act as "intelligent teaching assistants" to directly operate generative artificial intelligence tools, presenting abstract algorithm ideas, data classification, pattern recognition and other core concepts of the subject through intelligent generated image analogies, animation demonstrations, and storytelling.Entering middle grade stage, students have preliminarily acquired logical reasoning and language organization abilities, and teachers turn to designing semi-structured prompt templates, building cognitive scaffolding for students' human-machine dialogue, these templates, while retaining certain open space, provide clear restrictions on boundaries of questions, answer formats, and directions of thinking, thus guiding students to carry out purposeful dialogic inquiry with artificial intelligence within fixed framework, for example, in 'Algorithm and Programming' unit, teachers can design set of structured prompts, requiring students to use intelligent tools to generate multiple conditional branch statements for same programming task, with the comparing and analyzing of logical structure and execution efficiency of different solutions helping students rise from level of concrete code operations to level of algorithmic thinking comparison and optimization. In senior grade stage, students' metacognitive monitoring abilities and critical thinking have developed significantly, and teachers also gradually open up training in open-ended questioning and critical evaluation of results, encouraging students to independently design prompt strategies based

on real problem contexts, which enables them to perform logical verification, comparative analysis, and iterative optimization on multiple sets of solutions generated by artificial intelligence.

4.2 Designing an appropriate path for the intervention of generative artificial intelligence based on the core concepts of the discipline as anchor points

This is a key path of second point, taking the system of core concepts of information technology curriculum as anchor points, precisely designing intervention nodes and ways of action of generative artificial intelligence, avoiding technological application from becoming 'use for the sake of use' that deviates from subject objectives, teachers need to organize key links around subject big concepts such as 'data and information', 'algorithms and programs', 'networks and communications' and 'digital systems and devices', identifying key links where students easily encounter cognitive obstacles or thinking bottlenecks in unit teaching, and then introduce generative artificial intelligence at these nodes to serve as cognitive tools. In teaching of 'algorithm' concept, generative artificial intelligence can be used to present different algorithm solutions for same problem through natural language comparative analysis, helping students understand differences in algorithm efficiency, rather than staying only at code implementation level. In teaching of 'data encoding', intelligent tools can be used to generate diversified encoding examples, and can also simulate encoding conversion process, transforming abstract rules into visualized dynamic demonstrations, with this path design of using subject logic to govern technological application ensuring technology serves subject's educational goals, thus also preventing intelligent tools from occupying teaching content, thereby making generative artificial intelligence truly become a fulcrum for leveraging deep learning, rather than an external device that replaces thinking.

4.3 Establish a dynamic regulation and reflection mechanism for the tripartite interaction of "teacher student intelligent tool"

In the face of the dilemma of content loss of control and inaccurate evaluation caused by the reconstruction of classroom interaction mode after the intervention of generative artificial intelligence, establishing a three-dimensional interaction mechanism with dynamic regulation and reflective practice as the core is an effective response strategy. This mechanism regards classroom interaction as a dynamic system of collaborative evolution among teachers, students, and intelligent tools. Teachers play the role of the "regulatory center" and preset the usage boundaries and output ranges of intelligent tools before class. They use carefully designed prompt words to constrain the domain and difficulty level of generated content; Implement a segmented output strategy in class, breaking down the complete response of intelligent tools into multiple progressive segments and gradually presenting them. After each segment is presented, teachers organize students to make predictions, engage in discussions, and ask questions, and then continue to obtain subsequent content, thereby transforming the uncontrollable generation process into a controllable exploration sequence.

At the same time, teachers need to guide students to establish a "procedural work portfolio", which fully records the original questions, intermediate outputs, and student modification traces of each human-computer dialogue, forming a traceable learning trajectory. After class, teachers conduct retrospective analysis of students' thinking development paths based on portfolio information, reflect on whether the timing and methods of intelligent tool intervention are effective, and feedback the reflection results to the next round of teaching design, forming a closed-loop improvement system of "preset execution recording reflection optimization", gradually resolving the uncontrollability of generated content and the authenticity crisis of evaluation in dynamic

adjustment.

5. Conclusion

Generative artificial intelligence provides a technological opportunity for primary school information technology teaching to shift from skill imparting to literacy cultivation. However, its application is not a simple tool introduction, but a systematic project involving cognitive adaptation, teacher empowerment, and classroom reconstruction. This article argues from three dimensions: practical foundation, dilemma analysis, and practical strategies, revealing that the key to achieving organic integration between technological logic and educational logic lies in using the laws of children's cognitive development as a standard, using core subject concepts as anchor points, and ensuring teacher leadership. Only by establishing a hierarchical collaborative teaching framework, precise and appropriate intervention paths, and dynamic reflection regulation mechanisms can generative artificial intelligence be transformed from potential technological potential into practical teaching effectiveness, and open up practical pathways for the high-quality development of primary school information technology courses.

References

[1] ZHAN Mengying. Research on interdisciplinary thematic teaching of primary school information technology supported by artificial intelligence[J]. Primary and Secondary School Educational Technology, 2026(11): 13–15.
[2] GUO Hao, WANG Yue. Artificial intelligence empowering the reform of primary school information technology teaching: Problem analysis and countermeasure construction[J]. China Educational Technology Equipment, 2026(9): 73–76.
[3] ZHANG Shuyu. Practice of artificial intelligence-supported algorithm teaching in primary school information technology education[J]. Primary and Secondary School Educational Technology, 2026(8): 43–45.
[4] ZHU Lina. Research on implementation strategies for artificial intelligence teaching in primary school information technology education[J]. Examination Weekly, 2026(15): 115–118.
[5] YU Congmo. Discussion on primary school information technology teaching from the perspective of artificial intelligence[J]. Primary and Secondary School Educational Technology, 2026(5): 22–24.