WHIOCE PUBLISHING PTE. LTD.
PROVIDING
FIRST-CLASS SCIENTIFIC INFORMATION
FOR TOP SCHOLARS

2025 Volume 3, Issue 9
Lecture Notes in Education, Arts, Management and Social Science
ISSN(Online): 2705-053X

A Practical Study on the Interdisciplinary Integration of Primary School Information Technology Based on Artificial Intelligence

Jiating Chen*
Jiuhua Primary School, Jiuhua Town, Rugao 226500, Jiangsu, China

**Author to whom correspondence should be addressed.*

Abstract: As a crucial vehicle for cultivating students' information literacy and innovative ability, the primary school Information Technology curriculum faces new demands for interdisciplinary integration in the context of artificial intelligence (AI). AI-empowered interdisciplinary integration requires breaking down subject barriers through technological means and constructing a knowledge connection network. Based on this, the article focuses on the instructional design level, proposing specific implementation pathways: utilizing AI to create contextualized learning environments, build interdisciplinary knowledge networks, improve interactive feedback mechanisms, and construct dynamic evaluation systems. Research indicates that the integration of AI technology significantly enhances students' problem-solving abilities, providing a replicable reference paradigm for smart education practices in the new era.

Keywords: Artificial Intelligence; Information technology; Interdisciplinary; Instructional integration

Online publication: October 26, 2025

1. Introduction

Amid the wave of the Fourth Industrial Revolution, artificial intelligence is profoundly reshaping the modes of production and lifestyle in human society. The Ministry of Education's "Education Informatization 2.0 Action Plan" explicitly proposes the strategic goal of "promoting the deep integration of information technology and education teaching," requiring the basic education stage to focus on cultivating students' digital literacy and interdisciplinary comprehensive abilities. Artificial intelligence, with its functional characteristics such as natural language processing, can effectively support teaching links like scenario simulation, resource integration, and intelligent interaction, providing technical support for interdisciplinary integration. Therefore, systematically analyzing the convergence points between AI technological features and the primary school subject system can offer theoretical reference and practical guidance for addressing the dilemmas of traditional teaching.

2. Core concepts of AI-based interdisciplinary integration

2.1. Intelligent technology as a medium for cognitive connection

The essence of artificial intelligence is an information processing system that simulates human cognitive processes, with its core value lying in establishing non-linear connections between knowledge points. In the interdisciplinary integration of Information Technology, AI, through technologies like natural language processing and knowledge graphs, can automatically identify semantic relationships between knowledge points from different subjects, transforming fragmented subject content into a structured knowledge network. For example, when students learn programming logic in the Information Technology course, AI can simultaneously relate it to algorithmic thinking in Mathematics, process design in Science, and structured expression in Chinese, forming a multi-dimensional cognitive framework. This mediating role of technology transforms subject boundaries from rigid divisions to flexible permeation, providing cognitive scaffolding for comprehensive learning.

2.2. Dynamic context as the field for problem solving

Traditional interdisciplinary teaching in Information Technology often suffers from difficulties in knowledge transfer due to a lack of context, whereas AI technology can create highly realistic virtual learning environments. Through augmented reality, virtual reality, and generative AI, teachers can construct complex problem scenarios incorporating multi-disciplinary elements: for instance, simulating an urban planning project requiring the integration of knowledge such as 3D modeling, spatial computation, color matching, and population distribution. This contextualized learning field not only stimulates learning interest but, more importantly, drives learners to actively mobilize knowledge from multiple disciplines through authentic problem-solving, thereby internalizing knowledge and enhancing abilities in the process of addressing complex issues.

2.3. Data intelligence as the engine for teaching optimization

The machine learning capabilities of AI shift the teaching process from being experience-driven to data-driven. Through the real-time collection and analysis of student learning behaviors, thinking paths, and knowledge mastery levels, AI can accurately identify individual cognitive characteristics and group learning patterns [1]. This data insight supports three main directions for teaching optimization: first, personalized learning path planning, dynamically adjusting the mix of subject content based on student competency profiles; second, interdisciplinary knowledge recommendation systems, automatically linking related subject resources based on current learning content; third, intelligent feedback on teaching strategies, optimizing interdisciplinary instructional design through the analysis of classroom interaction data. The involvement of data intelligence grounds interdisciplinary integration from a macro concept into actionable teaching improvements.

2.4. Human-computer collaboration as the foundation of the innovation ecosystem

AI is not a tool to replace teachers but a catalyst for reconstructing teacher-student relationships. In interdisciplinary integration, the teacher's role shifts from knowledge transmitter to learning designer, responsible for setting educational goals, controlling value orientation, and creating humanistic contexts; AI, meanwhile, undertakes technical tasks such as resource integration, process support, and evaluation feedback. This human-computer collaboration model preserves the human warmth of education while leveraging the efficiency advantages of technology, forming a triadic interactive structure of "teacher-led, AI-assisted, student-centered," laying the foundation for cultivating versatile talents possessing both technical rationality and humanistic spirit.

3. The significance of interdisciplinary integration in primary school information technology under AI

3.1. Promoting the systematic restructuring of students' cognitive frameworks

Traditional subject-based teaching easily leads to knowledge fragmentation, whereas AI-empowered interdisciplinary integration in primary school Information Technology establishes implicit connections between subjects through technological means. The natural language processing capability of AI can parse the semantic relationships between terminologies of different subjects, and knowledge graph technology can visually present the logical networks between concepts, helping students form a three-dimensional cognitive framework of "point-line-plane-body." For example, when solving the authentic problem of "designing a smart campus," students need to simultaneously mobilize knowledge from multiple subjects, such as Information Technology (sensor principles), Mathematics (data analysis), Art (spatial layout), and Chinese (proposal presentation). This composite cognitive process prompts the brain to establish cross-domain neural connections, fostering systemic thinking and problem-solving skills. AI's personalized recommendation function can also dynamically adjust the mix of subject content based on students' cognitive characteristics, achieving precise "brain-tailored" learning.

3.2. Driving the iterative upgrade of teachers' instructional abilities

Interdisciplinary integration places higher demands on teachers' knowledge structures, and AI technology serves as an empowering tool for teachers' professional development. On one hand, AI-driven intelligent lesson preparation systems can automatically correlate teaching resources from different subjects, generating interdisciplinary thematic case libraries, thereby reducing the cognitive load on teachers designing integrated curricula. On the other hand, classroom behavior analysis systems can capture teacher-student interaction data in real time, identifying teaching pain points through affective computing technology, providing a scientific basis for teachers to adjust their teaching strategies [2]. More importantly, AI prompts teachers to break away from "subject-based" thinking and transition to the role of "curriculum designers," cultivating interdisciplinary teaching innovation capabilities through human-computer collaboration. This transformation not only enhances the professional competence of individual teachers but also promotes the shift of the teaching community from knowledge transmitters to learning facilitators, building a new type of teaching workforce adapted to future education.

3.3. Reconstructing the adaptive development of the education ecosystem

The deep integration of AI and interdisciplinary integration is reshaping the value chain of basic education. At the technical level, AI breaks time and space constraints, introducing real-world problems into the classroom through tools like virtual laboratories and remote collaboration platforms, shifting education from "simulated practice" to "authentic creation." At the resource level, intelligent resource libraries can aggregate high-quality multi-disciplinary content on demand, forming a dynamically updated "education supermarket" to meet students' personalized learning needs. At the evaluation level, comprehensive evaluation systems based on multimodal data can fully record students' thinking processes, collaboration skills, and innovative performances during interdisciplinary learning, breaking through the limitations of traditional paper-and-pencil tests [3]. This ecological reconstruction shifts the education system from standardized production to adaptive development, laying an ecological foundation for cultivating versatile talents for the future.

3.4. Fulfilling the educational mission in response to the demands of the era

In the context of AI profoundly changing social structures, interdisciplinary integration becomes a key pathway for cultivating "T-shaped talents." Through the permeation of AI technology, students not only master information technology tools but also develop core competencies such as critical thinking, creativity, communication, and collaboration in the process of solving complex problems. This educational model highly aligns with the "Chinese Student Development Core Competencies" framework, responding both to the new requirements for talent competency structures in the digital era

and adhering to the fundamental purpose of education, "fostering virtue through education" [4]. When students understand technological ethics and cultivate humanistic care through AI-assisted interdisciplinary learning, education truly achieves the value guidance of "technology for good."

4. Design of AI-based interdisciplinary integration in primary school information technology

4.1. Utilizing AI to create interdisciplinary contexts

Traditional Information Technology teaching often suffers from knowledge transfer difficulties due to a lack of context. AI technology can transform abstract technical principles into authentic problem scenarios close to students' lives through virtual simulation, generative content, intelligent interaction, and other means, providing cognitive anchors for interdisciplinary learning. Firstly, teachers can use AI-driven virtual simulation to build immersive learning fields. Take the "Coding and Life" unit for fourth graders as an example; traditional teaching only explains QR code principles through pictures or videos, making it difficult for students to understand their information storage logic. Using AI-driven AR technology, teachers can design a "campus treasure hunt" scenario: students use tablets to scan virtual QR codes, triggering interdisciplinary challenges that include math puzzles (e.g., calculating shape perimeter), science knowledge (e.g., plant growth conditions), and language tasks (e.g., interpreting clues from ancient poems) [5]. AI renders 3D scenes in real time, simulating QR code recognition effects under different environments, such as the impact of light intensity on scanning, enabling students to master multi-disciplinary knowledge like information encoding, mathematical operations, and scientific inquiry simultaneously while solving real problems.

Secondly, teachers can use generative AI to create personalized problem contexts. In the sixth-grade unit "The Process and Control of Being Everywhere," traditional cases are often fixed, such as teachers demonstrating voice assistants with fixed processes, which hardly stimulates deep thinking. Using generative AI, teachers can dynamically generate interdisciplinary problems aligned with student interests: for example, inputting students' favorite animation characters [6], like "help Xiong Da design a forest fire monitoring system," AI automatically generates a multi-dimensional task chain encompassing Information Technology (sensor principles), Science (combustion conditions), Art (system interface design), and Morality and Rule of Law (ecological protection responsibility). By setting keywords like "lower grade students" or "seasonal theme," teachers can prompt AI to generate tiered scenarios, meeting the learning needs of students with different abilities.

4.2. Utilizing AI to build interdisciplinary networks

AI's knowledge graph and semantic analysis technologies can automatically identify the associative logic between knowledge points from different subjects, helping students construct a three-dimensional cognitive network of "point-line-plane-body," solving the problem of knowledge fragmentation caused by traditional subject-based teaching. Teachers can use intelligent knowledge graphs to build visual subject correlation matrices. Take the sixth-grade unit "The Process and Control of Being Everywhere" as an example, the textbook covers technical knowledge points like sensors, network communication, and data processing, but does not clarify their intrinsic connections to subjects like Science, Mathematics, and Chinese. Using AI natural language processing technology, teachers can automatically parse textbook text to generate interdisciplinary knowledge graphs. The central node for this section's knowledge is "Internet of Things," with first-level branches including "Technical Layer" (sensors, communication protocols), "Application Layer" (smart home, smart agriculture), and "Humanities Layer" (privacy protection, technology ethics); second-level branches further link to Science, such as the relationship between temperature/humidity sensors and plant growth; Mathematics, such as choosing data visualization charts; Chinese, such as writing an IoT project proposal, etc. Students can use the interactive graph to independently explore the integration paths of different subject knowledge in IoT scenarios [7].

Secondly, teachers can also use AI's semantic analysis technology to recommend interdisciplinary resources. In the

third-grade unit "Use Digital Devices Well," after students initially learn about hardware components, they often remain at a superficial level of understanding due to a lack of extended learning resources. The AI semantic analysis system can deeply parse keywords submitted by students, such as "computer memory" and "hard disk working principles," not only recommending advanced resources in the field of Information Technology, such as 3D animations demonstrating memory read/write processes, but also linking to Mathematics, such as binary to decimal conversion exercises; Science, such as small experiments on computer chip materials; Art, such as designing hand-copy reports on computer internal structure, and other interdisciplinary resources. The resource recommendation algorithm dynamically adjusts recommendation weights based on student historical learning data, such as reading time and interaction frequency, forming personalized learning paths.

4.3. Utilizing AI to enhance interdisciplinary interaction

AI's intelligent interaction and collaboration support technologies can break the time and space constraints of traditional classrooms, building a multi-dimensional interaction network of "teacher-student, student-student, human-computer," promoting the deep collision and internalization of interdisciplinary knowledge. Teachers can use AI technology to create intelligent collaboration platforms for group cooperative teaching. For example, in the third-grade unit "Online Information Acquisition," interdisciplinary projects often suffer from low efficiency due to chaotic division of labor [8]. The AI collaboration platform can automatically form groups based on student ability assessments, such as IT operation skills, art design ability, and copywriting experience, and assign roles to each group, such as Technical Director, Art Director, and Copy Editor. The platform monitors the task progress of each role in real time. When it detects a lag in a certain link, such as unfinished copy affecting later dubbing, AI automatically triggers a warning mechanism and recommends collaboration strategies, such as "the Technical Director can complete the video editing framework first, waiting for the copy to be synchronized."

Secondly, teachers can utilize AI's intelligent learning companion function to promote personalized student communication. In the sixth-grade unit "Process and Control in Artificial Intelligence," when discussing complex issues like "liability attribution for autonomous vehicles," students often struggle to engage in deep communication due to differences in cognitive levels. The AI learning companion can play different roles, such as engineer, lawyer, and ethicist, engaging in dialogue with students: when a student proposes "technical faults should be the manufacturer's responsibility," the AI lawyer companion responds from a legal perspective, "the direct causal relationship between the fault and the accident needs to be proven," while the AI ethicist companion guides thinking about "the potential impact of algorithmic bias on vulnerable groups." AI uses affective computing technology to recognize student emotions, adjusting the dialogue difficulty appropriately to ensure the exchange remains within the student's "zone of proximal development."

4.4. Utilizing AI for interdisciplinary evaluation

Traditional evaluation emphasizes knowledge memorization and finds it difficult to measure interdisciplinary abilities. AI's multimodal data analysis and intelligent diagnostic technologies can construct an evaluation closed loop of "process recording - competency profiling - personalized feedback," achieving "evaluation for learning and evaluation for teaching." Teachers can use AI's multimodal data to comprehensively record the student learning process [9]. For example, in the fourth-grade interdisciplinary theme learning unit "Design and Make Campus Plant Business Cards," when students complete the "Campus Plant Species Survey" project, AI can simultaneously collect multiple types of data: recording group division of labor and collaboration duration through smart bracelets (Labor Education dimension), transcribing discussion content through speech recognition systems (Language Expression dimension), counting plant species through image recognition technology (Scientific Observation dimension), and recording data visualization code through the programming platform (Information Technology dimension). These data converge into the student's "Interdisciplinary Learning Portfolio," providing multidimensional evidence for comprehensive evaluation.

5. Conclusion

Through theoretical construction and practical verification, this research systematically demonstrates the feasibility and effectiveness of empowering interdisciplinary integration in primary school Information Technology with artificial intelligence technology. Simultaneously, the study offers dual implications for the digital transformation of basic education: at the technical level, it reveals the deep integration mechanism of AI tools and subject teaching, providing demand-oriented guidance for the development of smart education products; at the educational level, it constructs an implementation path for cultivating core competencies, providing methodological support for the implementation of the new curriculum standards [10]. Future research could further explore integration models across different educational stages and different subjects, optimize the educational adaptability of AI tools, and ensure that educational innovation consistently serves the fundamental task of fostering virtue and cultivating talents.

Disclosure statement

The author declares no conflict of interest.

References

[1] Xu M, 2025, Exploration of the Integration Path Between Primary School Information Technology and Artificial Intelligence From an Interdisciplinary Perspective. Primary and Secondary School Information Technology Education, (3): 59–60.

[2] Liu Q, 2023, Exploration of Interdisciplinary Teaching Methods in Primary School Information Technology Classrooms From the Perspective of Artificial Intelligence. New Curriculum Teaching (Electronic Edition), (13): 119–121.

[3] Tang Y, 2023, Practical Exploration of Interdisciplinary Teaching of Artificial Intelligence in Primary Schools—Taking "Intelligent Line-Following Car" as an Example. Anhui Education Research, (25): 71–73.

[4] Liang Y, Liu R, Gao S, 2022, Interdisciplinary Integration Teaching of "Artificial Intelligence + X" in Primary and Secondary Schools: Theoretical Framework and Practical Strategies. E-Education Research, 43(10): 94–101.

[5] Qin F, 2024, Artificial Intelligence + X: Practical Strategies for Empowering Interdisciplinary Integration Teaching. Journal of Seeking Knowledge Guide, (6): 2–4.

[6] Huang H, Xu M, 2022, Design and Practice of Comprehensive Artificial Intelligence Courses in Primary Schools Under the STEAM Concept—Taking Project-Based Teaching of "Epidemic Prevention Safety Gate" as an Example. Primary and Secondary School Information Technology Education, (10): 77–78.

[7] Ren Y, 2022, Analysis of the Reform Strategies of Primary School Information Technology Teaching From the Perspective of Artificial Intelligence. Education Informatization Forum, 6(4): 90–92.

[8] Wang L, 2022, Practical Research on the Design of Interdisciplinary Themes in Information Technology Teaching. China Information Technology Education, (12): 26–29.

[9] Zheng X, Li Q, 2023, Practical Research on High-Quality Classroom Teaching of Artificial Intelligence Based on Interdisciplinary Integration. China Information Technology Education, (4): 104–107.

[10] Meng Q, 2025, Innovative Research on the Application of Artificial Intelligence in Primary School Information Technology Teaching. China Computer & Communication, 37(6): 36–38.