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# Research on Integrated Teaching of Artificial Intelligence and Science Courses in Junior High School from an Interdisciplinary Perspective

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**Abstract:** Against the backdrop of deepening digitalization in education, the requirements of science courses for data understanding, model building, and inquiry methods, and the emphasis on algorithmic awareness and intelligent tool use in artificial intelligence courses, have formed a natural connection, providing a practical basis for the integration of the two courses. This study explores the challenges of integrating artificial intelligence and science courses in junior high school and discusses effective integration pathways, aiming to provide a workable reference for interdisciplinary teaching.

**Keywords:** Interdisciplinary integration perspective; Junior high school; Artificial intelligence; Science curriculum; Integrated teaching

The rapid penetration of artificial intelligence (AI) technology is driving continuous changes in social production methods and thinking patterns, posing new requirements for basic education to cultivate innovative learning abilities. The science curriculum in junior high school emphasizes the process of inquiry and logical evidence, while AI education focuses on algorithmic thinking and data processing. The two have a high degree of correlation in knowledge structure and ability objectives, making interdisciplinary integration a key approach to enhancing students' comprehensive literacy. Promoting integrated teaching helps enhance students' understanding of complex problems, deepen their inquiry in real-life situations, and facilitate the simultaneous development of scientific thinking and intelligent thinking. In the context of new curriculum reform and digitalization of education, exploring the integration model of AI and science curriculum holds significant practical value and innovative significance, and also actively promotes the construction of school curriculum systems and the transformation of teachers' teaching methods.

## 1. Challenges in Integrating Artificial Intelligence and Science Courses in Junior High School

### 1.1 Insufficient cohesion in course content

The challenge of insufficient curriculum content cohesion is particularly evident in the process of integrating artificial intelligence (AI) courses with science courses in junior high school. This is because there are significant differences between the two courses in terms of the way knowledge systems are constructed, the logic of learning progression, and the depth of concept presentation. Teachers often find it difficult to find stable and clear content connection points when promoting integrated teaching. AI courses emphasize concepts such as algorithmic thinking, data awareness, and intelligent control, which are developed based on computational processes and logical reasoning. On the other hand, the core of science courses lies in observing phenomena, constructing models, conducting experiments, and supporting the formation of laws through evidence. Knowledge progression often unfolds along the vertical chain of natural science disciplines. This structural difference leads to students feeling a significant conceptual leap in interdisciplinary learning, making it difficult to effectively connect abstract algorithmic ideas with specific scientific phenomena, thereby affecting the coherence of learning and the depth of understanding. In the process of designing teaching tasks, teachers often lack a systematic framework for integration, making it difficult to naturally embed AI content into the scientific inquiry process. This makes it challenging for the curriculum to form a unified thematic logic, and the teaching pace is also easily affected by content discontinuities.

### 1.2 Insufficient interdisciplinary integration ability of teachers

The challenge of teachers' insufficient interdisciplinary integration ability is particularly prominent in the integration process of artificial intelligence and science courses. Due to the differences in knowledge foundation, teaching methods, and professional backgrounds between the two courses, it is difficult for teachers to construct a coherent and in-depth integrated learning environment in the classroom. Artificial intelligence courses rely heavily on concepts such as programming logic, data processing, and intelligent control, with the teaching process emphasizing abstract thinking and technical operations. On the other hand, science courses rely on methods such as experimental inquiry, model construction, and evidence-based reasoning, with learning activities focusing more on the explanation of natural phenomena and the formation of laws. When lacking cross-disciplinary knowledge reserves, teachers often struggle to accurately grasp the relevance between the two types of content and cannot determine which scientific concepts are suitable for introducing artificial intelligence tools to support, nor can they identify which artificial intelligence knowledge can form a stable logical chain with scientific inquiry. This leads to issues of fragmented activities in teaching design. The lack of interdisciplinary ability is also reflected in teachers' understanding depth of integrated courses. Some teachers are accustomed to organizing teaching within the framework of a single discipline, and when faced with interdisciplinary tasks, they tend to simply superimpose the two courses, lacking the goal orientation and structural coordination from an integrated perspective. The content presented in the classroom is neither systematic nor coherent in terms of inquiry.

### 1.3 Limited teaching resources and equipment conditions

The challenge posed by limited teaching resources and equipment conditions has become a prominent constraint in the integration process of artificial intelligence (AI) and science courses in junior high schools. This is because integrated teaching increasingly relies on experimental equipment, technical tools, and digital platforms, while school resource allocation and maintenance capabilities often struggle to meet the needs of multidisciplinary integration. AI-related activities require relatively complete sensor kits, intelligent control modules, data acquisition devices, and visual analysis platforms, while scientific experiments require a sufficient number of diverse and well-maintained experimental materials and measurement tools. However, schools often face shortcomings in funding, equipment updates, and technical maintenance, significantly affecting the continuity and feasibility of teaching activities. Some schools' AI equipment can only support basic operations, making it difficult to form a deep integration with scientific inquiry. This leads teachers to reduce the complexity or scale down the content of activities when designing integrated tasks, thereby affecting the authenticity of interdisciplinary contexts and the integrity of the inquiry chain.

## 2. Paths for Integrating Artificial Intelligence and Science Curriculum Teaching in Junior High Schools from an Interdisciplinary Perspective

### 2.1 Construct cross-disciplinary thematic tasks based on real-life scenarios

Constructing interdisciplinary thematic tasks based on real-life scenarios requires middle school science teachers to take real-life scientific problems as entry points in curriculum integration. Through scenario creation, teachers guide students to generate exploration motivation in specific and tangible contexts, and gradually introduce artificial intelligence (AI) tools during the problem analysis process, enabling students to integrate scientific knowledge with AI thinking within a unified task framework. When designing thematic tasks, science teachers need to select authentic and exploratory contexts around the course content, such as environmental change, energy utilization, or life and health, and clarify the development path of scientific concepts in the task structure. At the same time, they should reserve space for AI technology intervention, so that the task can form a natural transition between scientific exploration and intelligent analysis. Science teachers need to construct a continuous activity chain in teaching organization, allowing students to gradually use sensors, data platforms, or simple intelligent control tools in the process of observation, questioning, experimentation, recording, and analysis, thereby enabling AI to play a supporting role in real-life tasks.

### 2.2 Integrating artificial intelligence into data collection and analysis in scientific experimentation and exploration

The teaching path of embedding artificial intelligence data collection and analysis in scientific experimentation requires junior high school science teachers to construct a complete inquiry chain from phenomenon observation to data acquisition and then to law inference when designing experimental activities, and to introduce suitable AI tools into it, enabling students to experience data-driven analysis methods in the core process of scientific inquiry. Science teachers need to integrate AI intervention into experimental objectives, variable selection, and measurement methods when organizing experiments, allowing students to obtain more continuous and precise experimental data through sensors, data recording modules, or intelligent acquisition devices, thus providing sufficient evi-

dence support for subsequent analysis. Science teachers need to guide students to organize experimental results on a data visualization platform during the progression of activities, presenting the relationship between variables through line charts, scatter plots, or dynamic change curves, and guiding students to utilize AI's pattern recognition function to understand the trend of data changes during the analysis process, enabling students to deepen their understanding of scientific concepts at the data level. Science teachers also need to emphasize the formation of an evidence chain in inquiry guidance, allowing students to explain experimental phenomena based on data and construct reasonable scientific inferences during the analysis process, so that AI technology truly becomes an analytical tool in the inquiry process rather than a simple demonstration method.

### 2.3 Promoting the deep integration of scientific concepts and AI technology through project-based learning

To promote the deep integration of scientific concepts and artificial intelligence technology through project-based learning, junior high school science teachers need to construct a learning process driven by real-world problems and carried by interdisciplinary tasks in curriculum design, enabling students to develop a comprehensive understanding of scientific knowledge and AI methods through continuous project progression. When planning project themes, science teachers need to select concepts with exploratory value from the science curriculum content and choose scenarios where AI technology can be used for monitoring, analysis, or control, so that the project can have both the logic of scientific inquiry and the space for technological application. In project structure design, science teachers need to arrange continuous steps including problem posing, plan formulation, data collection, model construction, and result presentation, and set up links involving AI technology participation at each stage, so that students can understand the connection between algorithmic thinking and scientific thinking through operation. In classroom organization, science teachers need to guide students to collaborate around project goals, allowing them to experience the process of multi-role collaboration in tasks such as experimentation, programming, structure building, and conclusion expression, so that interdisciplinary integration naturally emerges in a real task chain.

## Summary:

The integration of artificial intelligence (AI) and science courses can provide students with learning scenarios that are more closely aligned with real-world problems, enabling the understanding of scientific concepts to transcend the confines of laboratory settings. The application of AI technology also gains a clear learning medium. The interdisciplinary teaching structure allows students to experience the thinking process from observation to modeling to decision-making in a continuous exploration, naturally developing their comprehensive abilities through multidimensional activities. The advancement of integrated practice requires a stable connection between course logic, task structure, and classroom organization, enabling effective embedding of AI technology within the main thread of scientific inquiry in teaching activities.

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