# AIGC Helps Students in Pre-education to Improve Digital Teaching Ability

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## ABSTRACT

To enhance the digital teaching capabilities of preschool education majors, Qingdao Hengxing University has constructed an AIGC technology integration path from three aspects: training system, teaching paradigm, and practical ecology. In terms of the training system, with the framework of "concept innovation - institutional guarantee - resource integration", it is incorporated into the professional development plan, a three-level linkage management mechanism is established, and government-industry-university-research-application collaboration is carried out to obtain resources. In the teaching paradigm, a three-tier curriculum matrix is built, integrating AIGC with general education, core courses, and innovative projects to achieve a balance between instrumental and value rationality. In the practical ecology, a practical training network connecting virtual simulation, campus practice, and kindergarten application is constructed. Through the virtual kindergarten system, maker space, and the "1+1+1" kindergarten practice model, it promotes the transformation of students' technical application capabilities from theory to practice, providing support for the cultivation of digital talents in preschool education.
**Keywords:** AIGC, Digital teaching capabilities, Preschool education

## INTRODUCTION

With the deep integration of digital technology and education, the demand for preschool education talents with digital teaching capabilities has become increasingly prominent. The 14th Five-Year Plan for National Education Informatization explicitly requires "promoting education digital transformation and cultivating talents with digital literacy," which highlights the national strategic significance of this research. However, traditional preschool education talent training models face three key problems: disconnection between theoretical teaching and digital practice, single training methods, and insufficient integration of emerging technologies (e.g., AIGC). These issues lead to graduates being unable to meet kindergartens' digital teaching needs, creating a gap between talent supply and market demand.

Existing studies on educational technology in preschool education mostly focus on individual digital tools (e.g., basic teaching software) but lack systematic research on integrating AIGC into the entire talent training system. There is no complete framework covering curriculum design, practical training, and management mechanisms, and the effectiveness of technology-driven talent training has not been fully verified.

The purpose of this study is to develop a scientific and feasible AIGC-integrated talent training model aimed at addressing the practical challenges in cultivating preschool education students' digital teaching capabilities. Specifically, this study seeks to explore effective ways of embedding AIGC into professional training systems so as to enhance students' ability to apply digital technologies in real teaching contexts. Based on this objective, the study is guided by the following research questions. First, how can a "trinity" development framework be constructed to integrate AIGC with preschool education professional training? Second, how can a hierarchical curriculum matrix be designed to achieve in-depth coupling between AIGC and professional courses? Third, how can a multi-dimensional collaborative training network be established to facilitate the transformation of students' digital teaching capabilities from theoretical understanding to practical application?

## THEORETICAL FRAMEWORK

This section systematically sorts out theoretical foundations, core concepts, and literature gaps to position the study's academic value.

1. Core Concepts

Digital Teaching Competence of Preschool Education Majors: Refers to students' comprehensive ability to apply digital technologies (e.g., AIGC) in preschool scenarios to complete teaching design, activity organization, and child development evaluation. It includes four dimensions: technical application ability, educational design ability, ethical literacy, and data analysis ability.

AIGC Integration in Preschool Education: On the premise of adhering to the educational nature of promoting children's all-round development, AIGC technologies (e.g., multi-modal content generation engines, virtual simulation systems) are organically integrated into talent training, curriculum teaching, and practical training to optimize the training process and improve quality.

2. Relevant Theoretical Basis

Technology Integration Theory: Emphasizes that educational technology integration is not a simple tool superposition but should be deeply embedded in the entire teaching system (curriculum objectives, content, methods, evaluation). This study uses this theory to ensure AIGC serves the core goal of preschool talent training (i.e., avoiding over-reliance on technology while ignoring educational humanity).

Constructivist Learning Theory: Argues that learning is an active construction process through interaction with the environment. This study designs project-based learning and virtual simulation training based on this theory to encourage students to explore AIGC applications in educational scenarios independently.

Collaborative Education Theory: Highlights multi-subject participation in talent training. The "government-industry-university-research-application" model adopted in this study integrates resources from universities, kindergartens, enterprises, and education authorities to form a joint force for talent cultivation.

3. Literature Gap and Research Positioning

Existing studies on preschool digital talent training have two main gaps. First is the content gap, which includes most studies focus on basic digital tools (e.g., teaching APPs) and lack systematic research on integrating AIGC into the entire training system (no framework covering concepts, systems, and resources). Second, the method gap, most studies are theoretical discussions, with insufficient empirical verification based on practical teaching (few studies provide specific data on ability improvement).

This study takes Qingdao Hengxing University of Science and Technology's preschool education major as a case, constructs a "trinity" framework, hierarchical curriculum matrix, and multi-dimensional collaborative network, and verifies the model's effectiveness with empirical data. It fills the gap in systematic AIGC integration with preschool education professional training and provides practical references for similar majors' digital reform.

## METHOD

This section details the research design to ensure the study's reproducibility, in line with the requirements of empirical research.

### Research Approach

This study adopted the action research method, which integrates four links: planning, implementation, observation, and reflection. A two-year practical exploration was conducted in the preschool education major of Qingdao Hengxing University of Science and Technology (from September 2022 to August 2024). The research adhered to the principle of combining theory and practice: during implementation, the training model was continuously optimized based on feedback from teaching practice and kindergarten applications, ensuring scientific and feasibility.

### Participants and Data Sources

Participants: A total of 286 students (Grade 2022: 142 students; Grade 2023: 144 students) majoring in preschool education; 12 professional teachers (responsible for curriculum design and teaching); 8 kindergarten teachers (part-time practical instructors, responsible for on-site guidance); 3 AI engineers (technical consultants, responsible for AIGC tool training).

The data sources for this study include quantitative, qualitative, and document-based data. Quantitative data are obtained from virtual simulation training evaluation reports, students' curriculum practice performance, and feedback on application effects in kindergartens, such as a reported 40%

improvement in autistic children's emotional recognition accuracy, providing objective evidence of training effectiveness. Qualitative data consist of student reflection reports, teacher teaching logs, expert demonstration meeting minutes, and case materials from student competition works, which offer deeper insights into the implementation process and learning outcomes. In addition, document data are drawn from school development plans, curriculum syllabuses, and cooperation agreements with kindergartens and enterprises, supplying contextual and institutional support information for the study.

**Research Instruments and Materials**

AIGC Teaching Suite: Donated by cooperative technology enterprises (total value: 3 million yuan), including core tools such as multi-modal content generation engines, child behavior simulation systems, and virtual game scene generation systems.

Virtual Kindergarten System: Built by the university's Intelligent Preschool Education Training Center, covering 20 typical teaching scenarios (e.g., separation anxiety comfort, outdoor game guidance) and supporting VR equipment access and real-time teaching behavior evaluation.

Evaluation Index System: Jointly formulated by preschool education experts, AI engineers, and kindergarten principals, including 12 core indicators (e.g., technical application proficiency, teaching design rationality, language affinity).

**Research Procedure**

The research was conducted over a total period of 24 months and divided into three stages. The preparation stage (Months 1–3) focused on literature review and needs analysis, including interviews with 15 kindergarten principals to identify digital teaching competency requirements, as well as expert demonstration meetings with eight specialists in preschool education and AI to formulate the "trinity" development framework and training objectives. The implementation stage (Months 4–22) involved constructing a hierarchical curriculum matrix and delivering AIGC-integrated courses, establishing a multi-dimensional collaborative training network, and organizing student participation in virtual simulation training (20 hours per student), campus practice (30 hours per student), and kindergarten practice (40 hours per student), while collecting data in real time through weekly training reports and monthly practice feedback. The final reflection and optimization stage (Months 23–24) centered on analyzing the collected data to summarize the model's strengths, such as significant improvements in students' abilities, and identifying existing problems, including insufficient ethical training, followed by adjustments to curriculum design—such as adding AIGC educational ethics modules—and improvements to training methods, including increased guidance hours from AI engineers.

**Data Analysis Method**

A mixed-methods approach (quantitative + qualitative) was used:

Quantitative data: Descriptive statistics and comparative analysis were conducted using Excel to calculate indicators such as "65% increase in separation anxiety soothing strategies" and "40% improvement in emotional recognition accuracy."

Qualitative data: Thematic analysis was used to extract core viewpoints from reflection reports and teaching logs, summarizing the model's strengths and areas for improvement.

## FINDINGS AND DISCUSSION

This section presents research results and links them to research questions and existing literature to highlight the study's innovation.

1. Construction of AIGC Integration Development Framework: Ensuring Training Direction and Standardization

To address the first research question ("How to build a 'trinity' framework"), the study constructed a "concept innovation–institutional guarantee–resource integration" framework, which effectively solved the disconnection between technology application and educational nature.

Concept innovation: The core principle of "technology serves education" was established, clearly stipulating that AIGC application must focus on children's all-round development (e.g., AI-generated picture books must conform to 3–6-year-old children's cognitive characteristics). This principle runs through the entire training process, avoiding the dissolution of educational humanity by technical instrumental rationality.

Institutional guarantee: A three-level linkage management mechanism (school → college → teaching and research section) was established: the Academic Affairs Office is responsible for credit recognition and quality monitoring; the college's Digital Teaching Ability Training Group coordinates

curriculum and training; the teaching and research section implements integration details. In addition, ethical norms were formulated (e.g., anonymous processing of AIGC-generated children's behavior data) to ensure standardized technology application.

Resource integration: The "government-industry-university-research-application" model was adopted: a Preschool Education Digital Research Center was established with the local Education Bureau (obtaining regional children's development big data); a kindergarten real case library was introduced; cooperative enterprises donated AIGC teaching suites.

Discussion: This framework solves three core problems in AIGC integration: "why to integrate" (concept guidance), "how to manage" (institutional guarantee), and "what resources to use" (resource integration). Compared with existing studies that only focus on tools, this framework ensures the professionalism of AIGC application and the educational nature of preschool education, laying a foundation for students' digital ability cultivation.

2. Design of Hierarchical Curriculum Matrix: Promoting In-depth Technology-Course Integration

To answer the second research question ("How to design a hierarchical curriculum matrix"), the study broke through the traditional binary curriculum structure and constructed a "basic layer–advanced layer–innovation layer" matrix, realizing in-depth coupling of AIGC and professional courses.

Basic layer: General courses such as "Artificial Intelligence and Preschool Education" and "Digital Teaching Tool Application" were offered. Through scenario-based case teaching (e.g., AIGC application in children's story creation), 92% of students could correctly identify AIGC's applicable scenarios in preschool education (course evaluation data).

Advanced layer: AIGC was integrated into core courses:

In "Early Childhood Language Education": An intelligent picture book co-creation unit was developed. Students designed themes based on the Guidelines for the Learning and Development of Children Aged 3–6, generated picture book drafts with AIGC, and optimized them according to children's language development characteristics. A student team's AI picture book for autistic children improved 8 children's emotional recognition accuracy by 40% (kindergarten feedback).

In "Kindergarten Game Guidance": A virtual game scene generation system was introduced. Students input game types (e.g., outdoor construction games), and the system automatically generated 3D scene schemes (including material placement and safety prompts). After teacher-student optimization, the schemes had high feasibility.

Innovation layer: An optional course "AIGC Preschool Education Innovation Workshop" was set up. Using project-based learning, students completed group research (e.g., "Ethnic Minority Culture Enlightenment AI Assistant"), which generated interactive courseware (covering Miao silver ornaments, Dong Grand Song) and was promoted in 3 kindergartens in Qiandongnan Prefecture.

Discussion: This matrix realizes progressive improvement of students' digital abilities: the basic layer lays a theoretical foundation, the advanced layer integrates technology into core competencies, and the innovation layer promotes application and innovation. Compared with existing single-course technology integration, this design balances instrumental rationality (technology application) and value rationality (educational goals), ensuring students' professional foundation and technical practicality.

3. Construction of Multi-dimensional Collaborative Training Network: Promoting Ability Transformation

To respond to the third research question ("How to build a multi-dimensional collaborative network"), the study constructed a network linking virtual simulation, campus practice, and kindergarten application, forming a complete AIGC application chain from theory to practice.

Virtual simulation training: Relying on the Virtual Kindergarten System, students used VR equipment to complete tasks (e.g., comforting virtual children with separation anxiety). The system's teaching behavior analysis module marked 12 indicators (e.g., language affinity) in real time and generated improvement suggestions. Results showed Grade 2023 students' separation anxiety soothing strategies increased by 65%, making up for the lack of dynamic feedback in traditional micro-teaching.

Campus practice: A carrier combining a maker space and a competition platform was built:

The AIGC Teaching Resource Maker Space was equipped with 4K video equipment and motion capture instruments. Students converted AIGC-generated materials into teaching tools (e.g., adapting 24 solar terms stories into shadow play scripts).

The "Future Preschool Education Maker Competition" was held annually. In 2024, 132 works were received, and many were promoted in cooperative kindergartens.

Kindergarten application: A "1+1+1" practice model was implemented (1 university tutor for technical guidance, 1 kindergarten teacher for educational guidance, 1 student for AIGC-integrated teaching). Grade 2023 interns in a Guiyang kindergarten used AIGC to generate Qingdao landscape-themed picture books and combined AR technology to enhance children's regional cultural identity. After practice, a Compilation of AIGC Preschool Education Practice Cases was formed.

Discussion: This network solves the disconnection between theory and practice in digital ability cultivation: virtual simulation provides a safe practice environment, campus practice stimulates innovation, and kindergarten application tests practical effects. The three links form a closed loop, promoting students' ability transformation from theoretical cognition to practical application.

## CONCLUSION

This study explored AIGC-driven paths to improve preschool education students' digital teaching capabilities through a two-year practice at Qingdao Hengxing University of Science and Technology. The main conclusions of this study are as follows. First, the framework of "concept innovation–institutional guarantee–resource integration" effectively ensures both the direction and standardization of AIGC integration in preschool education talent training. Second, the "basic layer–advanced layer–innovation layer" curriculum matrix enables in-depth coupling between AIGC and professional courses, thereby facilitating the progressive improvement of students' digital teaching capabilities. Third, the multi-dimensional collaborative training network that integrates virtual simulation, campus practice, and kindergarten application successfully promotes the transformation of abilities from theory to practice, producing significant outcomes such as a 65% increase in strategy diversity and a 40% improvement in recognition accuracy.

This study makes both theoretical and practical contributions. Theoretically, it constructs a comprehensive AIGC-integrated digital talent training model for preschool education, enriches the theoretical system concerning the integration of educational technology and preschool education, and provides a valuable reference for the digital transformation of related academic majors. Practically, the research outcomes have been implemented and validated in the preschool education program at Qingdao Hengxing University of Science and Technology, demonstrating that the proposed training framework, curriculum matrix, and collaborative training network possess strong replicability and promotion value, and can offer practical experience for other colleges and universities seeking to develop digital talent training models in preschool education.

This study has several limitations. First, it was conducted in a single university, resulting in a relatively limited sample scope; therefore, the applicability and effectiveness of the proposed model in different types of institutions, such as normal universities and vocational colleges, require further verification. Second, although the research cycle lasted two years, the long-term impact of the model on students' career development—such as their digital teaching performance five years after graduation—has not yet been examined and would require longitudinal follow-up studies. Third, the study mainly focuses on the construction and application of the training model, while research on AIGC educational ethics remains insufficient, particularly regarding issues such as the potential influence of virtual images on children's cognitive development.

Future research can be advanced in several directions. First, the sample scope should be expanded by conducting collaborative studies with normal universities and vocational colleges, allowing the model to be further optimized in line with the characteristics of different types of institutions. Second, longitudinal follow-up studies spanning five to ten years should be carried out to track graduates' career development and to verify the long-term effectiveness of the proposed model. Third, greater emphasis should be placed on research into AIGC educational ethics, including the formulation of ethical guidelines such as children's privacy protection in AIGC applications, in order to ensure the healthy and responsible development of digital preschool education. Finally, future studies may explore the integration of AIGC with a wider range of professional courses, such as Early Childhood Art Education, to further expand the application scope of AIGC in preschool teacher training.

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