ISSN: 2688-8653

The Impact of AIGC on the Cultivation of IoT Talents in Higher Education

Xiuli Huang, Ang Li* and Yu Zhang

School of Intelligent Control, Nanjing University of Science and Technology ZiJin College, Nanjing 210023, China

* Corresponding Author

Abstract

The emergence of Generative Artificial Intelligence (AIGC) has injected new momentum and possibilities into higher education. This paper explores the convergence between AIGC and IoT education, focusing on its roles in knowledge acquisition, experimental teaching, interdisciplinary integration, and personalized learning. Furthermore, it examines the profound impact of AIGC on talent cultivation models, competency structures, and industry–academia–research collaboration in the IoT field. On this basis, the paper proposes the AIGC+IoT Talent CoLab model for innovative talent cultivation, along with strategies such as curriculum reform, faculty training, and the enhancement of critical thinking, aiming to provide new insights for the development of IoT education in universities.

Keywords

AIGC, Internet of Things, Talent cultivation, Higher education.

1. Introduction

In recent years, the Internet of Things (IoT) has developed rapidly and has penetrated into multiple fields such as industrial manufacturing, smart cities, healthcare, transportation, and energy management.

Meanwhile, Generative Artificial Intelligence (AIGC) has been continuously developing, showing great potential in education, research, and engineering [1]. The rise of AIGC brings new opportunities for transformation in education. Through natural language processing, large-model reasoning, and multimodal generation, AIGC can quickly produce high-quality text, code, images, and data. This provides strong support for updating teaching content, building experimental environments, assisting academic research, and planning personalized learning paths. This trend offers new ideas for addressing the pain points in IoT talent cultivation in higher education.

At present, both domestic and international academia and education sectors have begun to explore the application of AIGC in education. Abroad, universities such as MIT and Stanford have introduced AI assistants and intelligent code generation tools into classrooms, experimenting with human–AI collaboration to enhance learning outcomes, while also providing coping strategies for information overload[2].

This paper aims to explore the influence of AIGC on IoT talent cultivation in higher education, and proposes the AIGC + IoT Talent CoLab model. This model provides new suggestions on integrating AIGC into talent cultivation objectives, resource support, and curriculum systems.

ISSN: 2688-8653

2. The Convergence of AIGC and IoT Education in Higher Education

AIGC possesses powerful natural language processing capabilities, enabling the shift from "passive receivers" to "active co-creators," encouraging students and educators to collaboratively shape the learning process, and thereby bringing about profound changes in educational practice [3]. AIGC can promote adaptive learning by offering flexible learning paths tailored to individual students, providing customized recommendations based on student performance, and introducing innovative assessment methods [4].

In terms of knowledge acquisition, IoT technologies evolve rapidly, while textbooks and course content often lag behind, making it difficult for students to stay up-to-date with the latest developments. Through natural language interaction and large-scale knowledge integration, AIGC can provide students with broad and timely learning resources, helping them quickly acquire interdisciplinary theoretical knowledge and practical cases. For example, when studying wireless sensor networks, students can not only learn about network topologies and protocol mechanisms through AIGC, but also master application development methods by using generated case studies and code examples—thus achieving a seamless transition from theory to practice.

In experimental teaching and virtual simulation, IoT education is often constrained by the cost and availability of hardware and software equipment, limiting students' opportunities for hands-on practice. AIGC can generate lab manuals, experiment steps, and simulation data according to teaching objectives, and even create complete IoT experimental scenarios in virtual environments. This allows students to learn and practice processes such as sensor deployment, data collection, network transmission, and security protection even in the absence of physical hardware. Such an approach significantly improves the accessibility and flexibility of experimental teaching while lowering the entry barrier to practice.

IoT education spans multiple fields, including computer science, electronic engineering, communication technologies, big data analysis, and artificial intelligence. Students often face fragmented knowledge across these areas. AIGC can help integrate multidisciplinary knowledge, breaking down complex problems and generating cross-domain solutions. For example, when designing a smart city project, students can use AIGC to simultaneously obtain insights into data communication protocols, database optimization methods, and AI algorithm applications—thus forming complete knowledge chains and innovative thinking at interdisciplinary intersections.

In terms of personalized learning and intelligent tutoring, IoT curricula are complex, and students' levels of knowledge and understanding vary widely. Traditional teaching methods struggle to accommodate these differences. AIGC has the ability to generate personalized learning paths and provide real-time feedback. It can create supplementary materials for weak knowledge areas, answer students' questions in real time, and even simulate human teachers for dialog-based tutoring. This significantly enhances students' self-directed learning and motivation. Beyond coursework, AIGC can also support students' research activities, assisting with literature reviews, experiment design, and data analysis—an important contribution to cultivating research-oriented talents.

3. AIGC + IoT Talent CoLab Talent Cultivation Model

The AIGC + IoT Talent CoLab model is designed to respond to the demand for interdisciplinary and innovative talents in the era of "new productive forces," aiming to build an ecosystem for talent cultivation that deeply integrates Artificial Intelligence Generated Content (AIGC) and the Internet of Things (IoT). Its core idea is to combine vertical full-stack IoT capability training with horizontal AIGC collaborative practices, guiding students to transition from "knowledge

ISSN: 2688-8653

receivers" to "problem-driven innovators," and to achieve value transformation in real industrial contexts. The design of this model not only focuses on technical skills but also emphasizes data governance, intellectual property compliance, engineering ethics, and humanistic literacy, thereby ensuring that students possess sustainable competitiveness in the fast-evolving intelligent industry environment. see Figure 1.

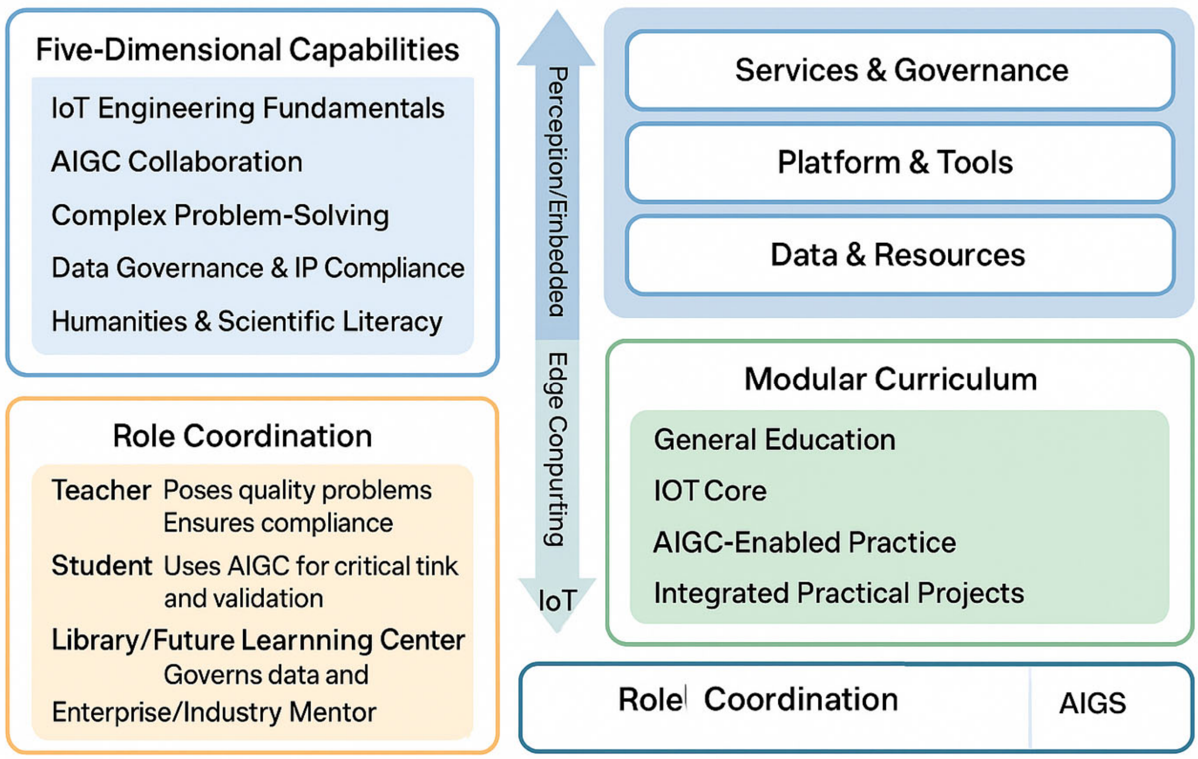

Figure 1. AIGC + IoT Talent CoLab Talent Cultivation Model

3.1. Vertical Capability Development

In terms of vertical training, CoLab divides the IoT competency system into five key areas:

- Perception and embedded systems
- Edge computing
- Networks and communication protocols
- Cloud and IoT platforms
- Data intelligence and security

Through systematic courses and experiments, students can gradually master the entire chain of technologies from underlying hardware to upper-level data intelligence, as well as understand the synergy among different layers. This vertical pathway enables students to design and implement end-to-end IoT systems independently, laying a solid foundation for cross-scenario transfer and solving complex problems.

The model emphasizes multi-party collaboration:

Teachers act as designers and supervisors of the "problem chain–decision chain–reflection chain," providing high-quality problem contexts and reviewing the ethics and compliance of AIGC outputs.

Students are the main "cognitive amplifiers," actively questioning, critiquing, and transferring knowledge with AI assistance to develop deep learning and cross-disciplinary innovation capabilities.

ISSN: 2688-8653

Libraries and future learning centers are responsible for data governance, platform integration, and digital literacy training.

Enterprises and industry mentors provide real data, scenarios, and internship opportunities to strengthen the connection between academia and industry.

The model introduces a “triple-chain” pedagogy that closely links problem chains, technical decision chains, and reflection chains. First, students pose problems based on real-world contexts (e.g., urban, industrial, agricultural, medical). AIGC expands these into multi-level problem scenarios, which are refined by teachers into main and sub-problem chains. Second, during the technical decision chain stage, students compare different sensors, protocols, or edge inference frameworks, using AIGC for evidence retrieval and experimental design, ultimately producing reproducible results. Finally, in the reflective chain, students conduct reflective writing and cross-scenario reconstruction with AIGC assistance, validating solution transferability through VR, simulations, or digital twins.

CoLab emphasizes a three-dimensional evaluation:

Process: quality of problem chains, prompt design, evidence-chain completeness, experiment reproducibility.

Output: code and documentation (AI-generated and human-revised sections must be labeled), simulation metrics, comparative experiments, and statistical significance.

Transfer: performance and reliability of solutions in new scenarios, along with the depth of reflective writing.

The use of AIGC is incorporated into grading criteria. Students are required to document the model, version, date, and prompts used, while key conclusions must undergo manual verification and external evidence support. Every AI-generated element must include a reliability statement covering risks, assumptions, and validation status.

3.2. Three-Layer Architecture

Meanwhile, horizontal training focuses on forming AIGC collaboration skills, including prompt engineering, automated agents, code and document generation, simulation modeling, multimodal content creation, and the critique and validation of generated results. In this process, students are not merely “users” of AI tools but treat them as cognitive amplifiers—solving problems while reflecting on and critiquing AI outputs, thereby cultivating critical thinking and cross-tool integration skills.

The AIGC + IoT Talent CoLab adopts a “three-layer integrated” training architecture:

Data and Resource Layer: The core is building a university-level learning and R&D data lake, integrating course resources, experimental data, open datasets, and project archives, along with metadata and access control mechanisms. This layer also embeds IP and compliance modules to ensure students follow copyright, licensing, and data protection requirements when using AIGC and IoT data.

Platform and Tools Layer: Provides an AIGC middleware and an IoT digital twin platform. The AIGC middleware supports access to multiple large and multimodal models, offering prompt template libraries, automated agents, and evaluation sandboxes. The IoT digital twin covers network/protocol simulations, edge-cloud collaborative sandboxes, and low-code visual orchestration, allowing students to quickly test and iterate in virtual environments.

Services and Governance Layer: Includes intelligent tutoring, personalized learning paths, academic writing feedback, accessibility services, and research-to-application support (enterprise problem banks, data sharing, open-source incubation, IP consulting). An ethics and risk-control module is also established to assess model usability, monitor errors and hallucinations, and ensure transparency and traceability throughout the process.

ISSN: 2688-8653

4. Conclusion

The AIGC + IoT Talent CoLab talent cultivation model proposed in this paper aims to align with the development trend of new productive forces and to explore new pathways for cultivating talents under the deep integration of Artificial Intelligence Generated Content (AIGC) and the Internet of Things (IoT).

This model takes “vertical full-stack capabilities + horizontal collaboration skills” as its core framework. It not only emphasizes the systematic mastery of IoT engineering fundamentals but also highlights the cultivation of students’ comprehensive competencies in cross-scenario transfer, critical validation, and deep innovation with the support of AIGC tools.

The AIGC + IoT Talent CoLab model is supported by four complementary measures—institutional design, technological tools, curricular resources, and training programs—to ensure effective implementation. Its ultimate goal is to cultivate interdisciplinary talents who both master IoT full-stack technologies and leverage AIGC as a cognitive amplifier to achieve cross-scenario innovation and value transformation. Such talents will provide a solid foundation for industrial development and social innovation.

Acknowledgements

Ministry of Education Supply-Demand Matching Employment and Education Project (2023122791045)

Jiangsu University Natural Science Foundation Project (21KJB510020), "Research on video intelligent processing and protection based on saliency region and deep learning method".

Nanjing University of Science and Technology Zijin College “High-End Talent Aggregation” Research Initiation Project (2024ZK0002).

The research project of Nanjing University of Science and Technology Zijin College research team, "Robotics and Intelligent Systems" (ZJSRT2023003).

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