

Research on the Dilemmas, Opportunities, and Transformation Paths of Talent Cultivation in Higher Education under the Empowerment of Artificial Intelligence

Jingjing Jiao*

College of Economics and Management, Zhaoqing University, Zhaoqing, Guangdong, China
jgxyjjj24edu@126.com
*Corresponding author

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Abstract: The rapid development of artificial intelligence (AI) is reshaping the talent cultivation model in higher education. As the main arena for cultivating innovative talents, universities are undergoing a profound transformation—from knowledge transmission to intelligent guidance, from standardized teaching to personalized learning, and from one-way instruction to multi-dimensional interaction. Based on the digital transformation of education empowered by AI, this paper systematically analyzes the current dilemmas in higher education talent cultivation, including insufficient digital literacy among teachers, weak personalized learning support for students, and lack of effective interaction and feedback mechanisms. It further explores the opportunities and ethical challenges brought by AI, and proposes transformation paths for building an intelligent talent cultivation system: enhancing teachers' AI-enabled teaching capacity, constructing intelligent learning support systems, and innovating educational governance mechanisms. The study provides theoretical and practical insights for universities to cope with educational transformation in the AI era.

1. Introduction

In recent years, Artificial Intelligence (AI), as the core driving force of a new wave of technological revolution, has profoundly influenced every aspect of the education system. From intelligent grading and virtual teaching assistants to learning analytics and adaptive instruction, AI technologies have gradually evolved from auxiliary tools to integral components of the educational ecosystem. The Education Digitalization Strategy Action Plan (Ministry of Education, 2022) explicitly emphasizes that AI empowerment should be leveraged to enhance educational quality and transform talent cultivation models. As a crucial pillar of the national innovation system, higher education urgently needs to adapt its talent training paradigm to this trend of intelligent transformation.

However, the integration of AI into education is far from a linear process. On one hand, it promotes teaching efficiency, optimizes learning experiences, and broadens educational equity. On

the other, it exposes new challenges such as disparities in teachers' digital literacy, insufficient student autonomy in learning, and ethical risks related to data use. Therefore, a systematic examination of the dilemmas and transformation pathways of talent cultivation in higher education under AI empowerment has become a pressing topic for both educational research and policy-making.

This study first analyzes the major dilemmas faced by higher education in talent cultivation. It then explores the opportunities and ethical challenges brought by AI-driven educational transformation. Finally, it proposes strategies for constructing an intelligent talent cultivation system, aiming to provide theoretical and practical references for educational reform in universities.

2. Dilemmas in Talent Cultivation within Higher Education

2.1 Faculty Dimension: Dilemmas of Teaching Digitalization

In the era of AI-empowered education, university teachers are undergoing a critical transformation of roles and competencies. Traditionally, classroom teaching has been teacher-centered, where instructors are regarded as “knowledge transmitters” (Shi & Zhang, 2022^[1]; Wang, 2024^[2]; Ji, 2013^[3]). The advent of AI, however, is pushing teachers toward new roles as “learning designers” and “intelligent facilitators”. Despite this shift, significant gaps remain in teachers' digital literacy. According to the Teachers' Digital Literacy Standards (2022) issued by the Ministry of Education, teachers are expected to possess capabilities in information awareness, data analysis, technology application, innovative teaching, and digital ethics. Yet, many university instructors remain at a basic level of application, lacking the ability to deeply integrate AI tools into teaching (Zhao, 2024^[4]; Zhang & Zhai, 2024^[5]; Tian & Xu, 2024^[6]).

Some educators express concerns that AI may weaken their classroom authority or contribute to the “dehumanization” of teaching, thereby diminishing initiative and creativity. As Edwards & Cheek (2018) point out, AI is not merely an instructional aid but a force that redefines the boundaries of the teaching profession^[7]. Achieving a balanced coexistence of human and machine—one that preserves the essence of education while leveraging AI's potential—has become a shared challenge for contemporary university teachers.

2.2 Student Dimension: Barriers to Personalized Learning Development

The introduction of AI offers students in higher education greater autonomy and flexibility in learning. Intelligent recommendation systems, learning analytics, and virtual tutoring can customize learning pathways according to individual interests and abilities. Nevertheless, the realization of personalized learning remains constrained by cognitive and motivational factors.

On one hand, many students lack self-regulation and information-filtering skills, often falling into “information overload” and superficial learning (Wang, 2021)^[8]. On the other hand, universities have yet to establish comprehensive support systems for personalized learning. Most AI-based learning platforms focus on resource recommendation and assessment assistance but fail to provide dynamic feedback or continuous progress tracking mechanisms.

The China Education Modernization 2035 blueprint explicitly calls for the “organic integration of large-scale education and personalized cultivation.” To achieve this goal, higher education institutions should not only advance AI empowerment but also cultivate students' metacognitive and reflective learning abilities, enabling them to achieve genuine autonomy and sustainable growth within AI-supported learning environments.

2.3 Teaching Interaction Dimension: Imbalances and Feedback Deficiency

Traditional university classrooms, characterized by the one-way “teacher lecture–student listening” model, can no longer meet learners’ growing needs for instant feedback and active participation in the AI era. Although “smart classrooms” and “learning analytics systems” have become increasingly prevalent, interaction often remains superficial—limited to attendance tracking, online Q&A, or post-class quizzes.

While AI can analyze learning behaviors and cognitive patterns through data analytics, many teachers lack the awareness and skills to utilize such data for instructional improvement. Furthermore, the introduction of AI into teaching relationships raises new ethical issues: students express concerns over data privacy and algorithmic bias, while teachers worry about the “algorithmization” of instructional evaluation, which may undermine trust in education (Sun et al., 2024)^[9].

Crowe et al. (2017) observed that AI systems may inadvertently encourage academic dishonesty by facilitating plagiarism or the use of essay mills and ghostwriting platforms^[10]. Therefore, the reconstruction of teaching interaction is not merely a technical challenge but also a matter of rebalancing educational relationships and restoring human-centered trust within AI-mediated learning environments.

3. Opportunities and Transformation Pathways of AI-Enabled Higher Education

3.1 Systemic Opportunities for Intelligent Education

Artificial intelligence (AI) provides unprecedented opportunities for systemic transformation in higher education.

First, at the teaching level, AI assists instructors in achieving precision teaching and intelligent assessment. Through technologies such as natural language processing, machine learning, and learning analytics, teachers can dynamically capture students’ knowledge structures and learning behaviors, enabling differentiated instruction and personalized tutoring. For example, intelligent grading systems can instantly identify conceptual errors in student assignments and generate targeted feedback (Mirzaeian et al., 2016)^[11], forming adaptive assessment systems based on learning behaviors (Zhu et al., 2020)^[12]. In addition, AI extends teachers’ instructional capabilities beyond the classroom. Virtual Teaching Assistant systems can provide 24-hour post-class Q&A support and learning resource recommendations, realizing a truly “boundaryless classroom.”

Second, at the learning level, AI-driven adaptive learning systems can dynamically adjust instructional content and pacing according to students’ learning trajectories and knowledge mastery. AI not only identifies learning bottlenecks but also predicts potential areas of interest through knowledge graph analysis (Chen & Fan, 2023)^[13]. This indicates a shift in education from “standardized supply” to “personalized growth,” where learners become active participants and creators in the learning process.

Finally, at the management level, universities can leverage AI to assist with resource allocation, curriculum evaluation, and student support services, thereby enabling data-driven decision-making. AI-powered campus management systems can optimize class scheduling and course selection through data mining, reducing administrative redundancy and improving governance efficiency. Moreover, AI can help policymakers simulate and forecast the outcomes of educational policies, enhancing the foresight and adaptability of decision-making.

3.2 Innovative Pathways for Talent Cultivation

AI-empowered talent cultivation models are characterized by personalization, intelligence, and collaboration.

First, AI enables truly personalized learning. Students can determine their learning paths and pace based on their cognitive levels and interests, while AI systems provide dynamic adjustments according to real-time data. For instance, AI learning companions can detect student fatigue and interest fluctuations through learning logs and sentiment analysis, allowing instructors to modify instructional strategies promptly.

Second, AI promotes the formation of intelligent learning environments. AI-based virtual laboratories can simulate complex experimental scenarios, providing students with low-risk and highly interactive inquiry opportunities (Ijaz et al., 2017^[14]; Yu & Xia, 2022^[15]). In disciplines such as engineering and medicine, AI simulation teaching systems have become essential tools for cultivating innovative talent. These environments enable students to bridge theoretical learning with real-world application, enhancing critical thinking and problem-solving skills.

Third, AI fosters cross-disciplinary collaboration in education. It breaks down traditional disciplinary boundaries and promotes new models of interdisciplinary talent development such as “AI + Education” and “AI + Management.” Furthermore, AI encourages the integration of academia, industry, and research, connecting universities, enterprises, and research institutions through intelligent platforms. This facilitates a collaborative ecosystem of knowledge co-creation and competency co-cultivation.

3.3 Balancing Educational Governance and Ethical Risks

While AI empowers education, it also introduces a range of ethical and governance challenges. These include data privacy breaches, algorithmic bias, accountability ambiguity, and compromised educational equity. Federspiel et al. (2023) warned that the misuse of AI could lead to social fragmentation and threats to human development^[16]. In educational contexts, opaque data collection and usage may result in privacy violations. Moreover, AI algorithms often operate as “black boxes,” making it difficult for teachers and students to understand the logic behind AI-driven decisions. For example, in automated assessment systems, algorithmic bias within training data may lead to unfair judgments, affecting students’ learning opportunities and evaluation outcomes. Artificial intelligence empowerment in higher education also entails potential risks to academic integrity. If misused, AI technologies may lead to plagiarism, ghostwriting, and other forms of academic misconduct. Such misuse could erode students’ independent learning ability and undermine the credibility of higher education institutions.

The increasing role of AI in teaching also raises concerns about the dehumanization of education, where teachers’ emotional engagement and humanistic care may be marginalized, potentially distorting the teacher-student relationship. UNESCO (2023) emphasizes that the application of AI in education must adhere to human-centered ethical principles, ensuring that technology serves the holistic development of individuals. Universities, while advancing educational intelligence, should establish robust AI governance mechanisms, including sound data security protocols and transparent algorithmic frameworks. This will ensure that AI remains a tool for educational enhancement rather than a source of inequity or ethical conflict.

4. Practical Strategies for Building an Intelligent Talent Cultivation System

4.1 Enhancing Teachers' Digital Literacy and Intelligent Teaching Competence

Teachers are the key drivers of AI-enabled education. Universities should systematically establish a framework for developing teachers' AI literacy and integrate AI-related training into professional development programs. On one hand, teachers should strengthen their information awareness, data analysis, and digital pedagogical competence, transitioning from “knowledge transmitters” to “learning designers.” On the other hand, institutions should establish AI Teaching Innovation Workshops to encourage educators to apply AI tools in authentic teaching contexts for curriculum design, formative assessment, and learning analytics.

Furthermore, AI can serve as a learning partner for teachers—it can assist in generating instructional materials, analyzing student learning profiles, and automatically producing performance reports. This reduces repetitive workload, enabling teachers to devote more energy to pedagogical innovation and student engagement.

4.2 Constructing Intelligent Learning Support Systems and Open Resource Platforms

Universities should establish data-driven learning support systems as the core of an intelligent learning ecosystem. By leveraging learning analytics, institutions can visualize the entire learning process, offering real-time feedback and continuous growth tracking. AI learning platforms can integrate students' learning logs, assessment records, and emotional data to generate personalized learning reports and growth portfolios, providing precise academic guidance.

In addition, universities should develop AI-powered open educational resource (OER) platforms that aggregate cross-disciplinary content and social learning materials to achieve resource sharing and educational inclusivity. Such platforms can foster lifelong learning and support students' diverse learning trajectories. Ultimately, this intelligent learning support infrastructure will become a cornerstone of future higher education services, enabling continuous feedback loops between learners, educators, and institutional governance.

4.3 Promoting Educational Governance and Institutional Innovation

AI-empowered educational governance requires not only technological support but also institutional innovation. Universities should establish AI Ethics and Education Committees to supervise and regulate the use of data collection, algorithmic assessment, and intelligent evaluation tools. At the same time, governments and universities must jointly formulate AI education standards, ensuring comprehensive protection in areas such as data security, algorithm transparency, teacher ethics, and student rights.

For example, the European Union's AI Act provides a valuable reference framework, emphasizing that AI applications in education must be integrated into a risk assessment mechanism to ensure fairness, accountability, and data protection. In China, it is essential to accelerate the development of the National Education Digitalization Standards System, forming a unified framework for intelligent education governance at the national level. Through coordinated policy efforts and institutional innovation, the sustainable development of AI in education can be effectively promoted, ensuring that technological progress aligns with educational equity and humanistic values.

5. Conclusion

AI empowerment in higher education represents not only a technological revolution but also a paradigm shift in educational philosophy. It fundamentally transforms both teaching and learning, reshaping the traditional relationship between teachers and students. The future of higher education should move beyond isolated teaching reforms toward systemic transformation in talent cultivation. By improving teachers' digital literacy, constructing intelligent learning support systems, and innovating governance mechanisms, universities can build a learner-centered intelligent education ecosystem. The core value of this ecosystem lies in realizing a "human-AI symbiotic" educational model, where AI acts as a partner that enhances human intelligence rather than a competitor that replaces it. In this process, the competitiveness of higher education institutions will increasingly depend on their capacity for human-AI collaborative innovation, data-driven decision-making, and intelligent educational governance. Only through the deep integration of technology, education, and humanism can higher education achieve high-quality and sustainable development in the age of artificial intelligence.

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