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AI Empowerment in Regional Universities: Constructing the "AI+1234" Talent Development Framework

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Abstract: Against the backdrop of a new wave of technological revolution and industrial transformation, artificial intelligence (AI) is profoundly reshaping the higher education ecosystem. As the main institutions for regional talent development, regional applied universities urgently need to explore intelligent teaching reform pathways tailored to their unique characteristics. This study constructs the "AI+1234" integrated education framework under AI empowerment, systematically exploring the deep integration mechanism between AI technology and the "1234 talent development model." It develops a five-dimensional collaborative implementation method: "Team–Curriculum–Resources–Community–Think Tank"—providing regional applied universities with a replicable and scalable intelligent transformation pathway. This framework offers a new paradigm for cultivating applied talents that meet the demands of the intelligent era.

Keywords: Artificial intelligence; Regional applied universities; Teaching paradigm shift; 1234 talent development model; Intelligent education

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1. Introduction

The world is currently at a critical juncture of a new wave of technological revolution and industrial transformation. The rapid development of emerging technologies such as the Internet of Things, big data, cloud computing, artificial intelligence (AI), smart manufacturing, and neuroscience is triggering a chain of breakthroughs, driving the continuous emergence of new technologies, products, business models, and modes. These changes have not only reshaped various aspects of economic activities but have also deeply altered human production methods, lifestyles, and modes of thinking, leading to an overall leap in social productivity and labor efficiency [1]. Against the backdrop of this "unprecedented transformation in a century," global competition is intensifying. Only by actively embracing the technological revolution can we enhance our ability

for independent innovation and achieve breakthroughs in key core technologies, thereby gaining more influence in future development.

In this context, higher education, as the core arena for talent cultivation, faces a new historical mission. The development of the new era requires universities to adapt to the challenges and opportunities brought by the technological revolution, promote the connotative development of education, and support the national innovation-driven strategy. Regional applied universities, as crucial pillars for regional economic and social development, bear the important responsibility of cultivating applied and interdisciplinary talents. However, the talent cultivation model in most regional universities remains relatively traditional and is struggling to meet the evolving demands of industrial upgrading and social development [2]. This contradiction urgently calls for empowering educational reform with emerging technologies such as AI, driving the innovation and transformation of teaching paradigms.

Historically, human civilization has undergone a leap from the Industrial Revolution 1.0 (steam engine era) to Industry 4.0 (smart era), with each industrial revolution profoundly changing the structure of social productivity and reshaping educational forms and talent cultivation methods. Currently, artificial intelligence, as the core driving force of the new technological revolution, is reconstructing the education ecosystem. It not only promotes the update of teaching concepts and the transformation of teaching methods but also fosters personalized learning and intelligent assessment, enhancing both the quality and efficiency of education [3,4]. For regional applied universities, the integration of AI is both an inevitable trend of educational modernization and a practical choice to drive regional economic and social development while serving national strategic needs.

Therefore, studying AI-enabled changes in the teaching paradigm of regional applied universities holds significant theoretical value—contributing to the expansion of research dimensions in AI and education integration and driving innovation in educational theory. It also has practical significance—offering feasible pathways for overcoming development bottlenecks, improving talent cultivation quality, and meeting the urgent demand for high-quality applied talents. To address these issues, this study constructs the "AI+1234" integrated education framework, providing an innovative theoretical path for the modernization of education, industrial development, and talent cultivation in regional universities.

2. Research progress at home and abroad

The integration of AI and education has gone through three key stages [5,6]. The nascent stage (1970s–1990s) was marked by Computer-Assisted Instruction (CAI), during which foreign scholar Carbonell first proposed the concept of Intelligent Tutoring Systems (ITS), laying the foundation for AI applications in education. The fluctuating period (1990s–2010s) witnessed the rise of adaptive learning systems, exemplified by Carnegie Learning's Cognitive Tutor, which represented an initial exploration into personalized learning pathways. The data-driven period (2010–present), fueled by breakthroughs in deep learning technology, has seen an explosive growth in educational AI, with intelligent education platforms such as Khan Academy and Duolingo making a profound global impact.

Four major trends have emerged in international frontier research: First, there is a shift from rule-based to data-driven approaches. Stanford University's research team used deep neural networks to precisely model learners' cognitive states [7]. Second, there is a development from single intelligence to multiple intelligences. The MIT Media Lab has incorporated affective computing into educational settings, enabling real-time perception of learners' emotional states [8]. Third, there is an evolution from tool application to ecosystem

construction. UNESCO's report, *Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development*, highlights the importance of an AI education ecosystem [9]. Fourth, there is a return from a technology-centered approach to a human-centered one. The EU's *Ethical Guidelines for Trustworthy AI* clearly propose a human-centered AI education principle [10].

Although China's research began later, it has developed rapidly. The *National Guide for the Construction of the AI Industry Comprehensive Standardization System (2024)*, *The State Council's Opinions on Deepening the Implementation of the "Artificial Intelligence+" Action (2025)*, and *China's Education Modernization 2035* provide policy support for the application of AI in education. Research institutions such as the Smart Learning Institute at Beijing Normal University and the Department of Educational Information Technology at East China Normal University have made progress in areas like intelligent guidance, knowledge graphs, and learning analytics. Companies such as iFlytek and TAL Education Group have launched products like smart classrooms and AI teachers, accumulating valuable practical experience [11,12].

The *Artificial Intelligence Empowering Education Modernization Action Plan*, jointly issued in 2024 by the Ministry of Education of the People's Republic of China and nine other departments, states that AI should be leveraged through large model technology to reshape talent cultivation paradigms and promote the "dual spiral enhancement of professional abilities and intelligent literacy." The plan emphasizes the development of 50 national-level AI-industry integration innovation platforms and the creation of 100 "AI+X" interdisciplinary courses, aiming to achieve precise alignment between educational data elements and industrial demands. These policies collectively point towards using AI as the core engine to build a modern educational ecosystem driven by "demand orientation, technology-driven, and industrial development."

3. Challenges faced by regional universities

Today, artificial intelligence, with its unique contextual characteristics, has established close connections with various academic fields and industries, achieving remarkable results and gradually becoming an independent branch with its own theoretical and practical system. After more than 60 years of development, AI is transitioning from a "concept" to "practice," exhibiting new characteristics such as deep learning, cross-disciplinary integration, human-machine collaboration, and collective intelligence. With the introduction of the new engineering education initiative in 2017, AI has once again gained momentum. However, there is still a lack of foundational theoretical guidance in China, and significant issues remain in AI talent development. Although AI applications in education have made significant progress, they still face many challenges that hinder the deep integration and sustainable development of AI in education.

3.1. The double-edged effect: The imbalance between AI innovation and education adaptation

Technological breakthroughs, such as generative AI and large models, are rapidly reshaping the educational ecosystem. This has led to a polarization phenomenon in classroom teaching, with "algorithm dependency" and "lack of humanities" emerging. There are significant generational differences in terms of technology acceptance, ethical awareness, and tool mastery among educational stakeholders, resulting in a mixture of enthusiastic, cautious, and concerned attitudes. This creates a tension between "technology advancement" and "educational lag."

3.2. The shackles of disciplinary barriers: The lack of collaborative efficiency in interdisciplinary talent cultivation

AI's cross-disciplinary application ability has driven the rise of the "AI+" educational concept. However, universities generally lack effective mechanisms for interdisciplinary teaching, preventing the full potential of AI integration with other disciplines from being realized. Many educational institutions face shortcomings in infrastructure development, curriculum design, and teacher training, making it difficult for educators to integrate AI technology into non-technical disciplines. As transmitters of knowledge, it is crucial for teachers to enhance their capabilities and promote the deep integration of artificial intelligence in education.

3.3. Knowledge iteration delay: The temporal and spatial disconnection between teaching content and technological frontiers

The rapid development of AI highlights the disconnection between teaching content and new technologies. Many traditional university curricula cannot cover cutting-edge technologies like AI and cloud computing, making it difficult for students to meet the modern industry's demand for high-quality "new engineering" talents. Currently, AI technology has demonstrated significant application value in industries like manufacturing and education, while the lag in university curricula restricts students' technological competitiveness. Therefore, universities urgently need to update their teaching content, integrate AI-related knowledge, and foster interdisciplinary skills through practical teaching to meet the pressing demand for interdisciplinary talents in regional economies and industries.

3.4. Value release bottlenecks: The disconnect between AI empowerment and internal development in regional universities

AI has immense potential to optimize teaching, research, and management, but many regional universities have not fully harnessed this value due to resource and technological limitations, making it difficult for them to achieve internal development and transformation through AI. Currently, AI's intelligent management systems and data analysis tools have enhanced efficiency in leading universities, but regional universities struggle to replicate these successful experiences due to a lack of funding and specialized talent. To break this bottleneck, regional universities need to enhance AI-enabled educational research projects through strategic and technical initiatives, tapping into AI's potential to improve education quality and drive regional development.

3.5. Supply and demand mismatch: The dynamic disconnect between talent cultivation and industry demand

Currently, the cultivation of AI talent faces a severe disconnect between theory and practice. On one hand, the overall quality of talent cultivation in universities is low, and there is a lack of comprehensive training mechanisms geared towards industrial applications. On the other hand, the demand from enterprises for multidimensional, multi-level, and interdisciplinary AI talent is increasing rapidly, which contrasts sharply with the traditional curriculum-based talent training models. With the widespread application of AI technology, the demand for industry jobs is rapidly shifting towards technology-driven roles. However, universities' teaching objectives do not align well with market demand, leading to a structural imbalance on the talent supply side. Graduates generally lack practical skills and job-specific training, making it difficult to meet the digital transformation requirements of relevant industries, thereby limiting their ability to effectively support regional economic development and industrial upgrading. In the face of the wave of regional economic transformation driven by AI technology, regional universities urgently need to make breakthroughs in the following areas:

adjusting talent cultivation goals, strengthening the industry-education integration mechanism, optimizing curriculum design, and increasing the proportion of practical teaching. These actions will effectively bridge the talent supply-demand gap and enhance the core competitiveness of regional development.

4. Theoretical framework of the "AI+1234" talent development model

In the face of the profound impact and new challenges posed by the new technological revolution, higher education must cultivate talents capable of adapting to these changes. Regional universities, as the main institutions for cultivating applied talent, currently rely on traditional talent development models that can no longer meet the diverse demands of the times. To address this challenge, in the context of the new engineering education initiative, we propose and study the "AI+1234" talent development model. This model aims to construct a clear and actionable framework tailored to the unique characteristics and development goals of regional universities, addressing the various issues faced in talent cultivation. The theoretical framework of the "AI+1234" talent development model is detailed in **Figure 1**.

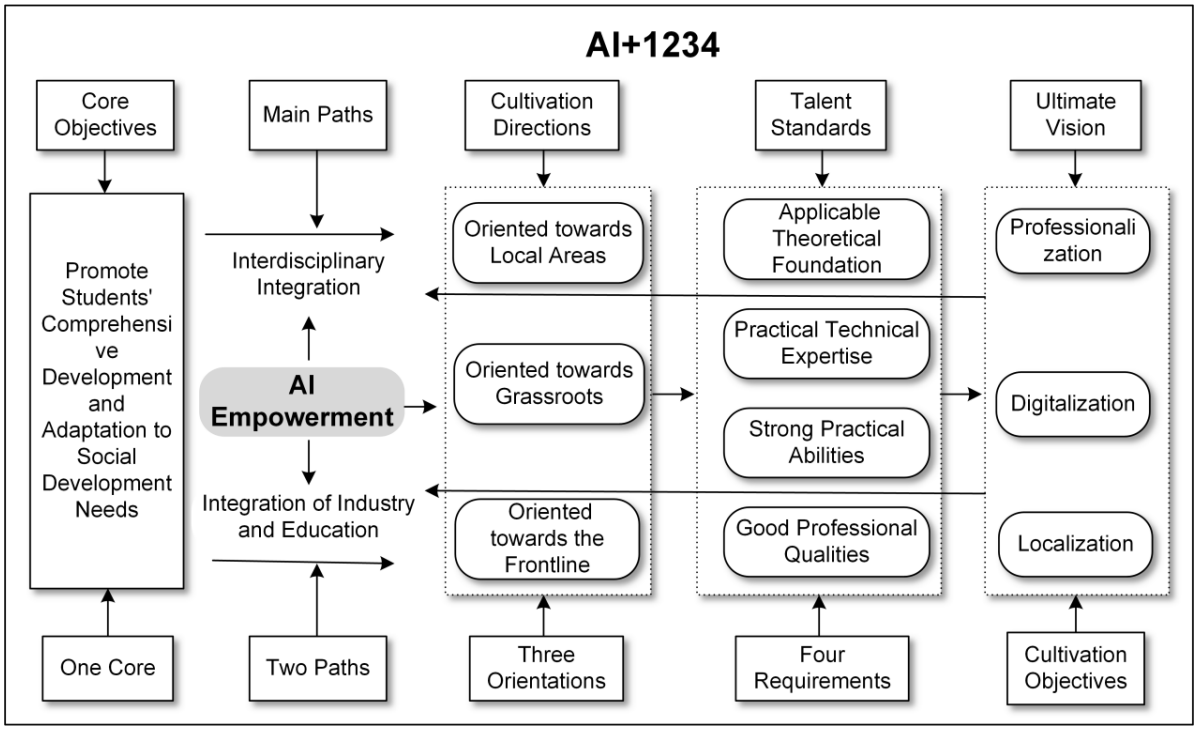

Figure 1. The theoretical framework of the "AI+1234" talent development model

(1) "1" One Core: The core focus is on promoting students' comprehensive development and adapting to societal development needs, answering the question of "What type of person should we cultivate?" Universities optimize curricula and reform teaching to align students' internal development with external societal requirements, thereby achieving the integration of personal and social value. It represents our ultimate core goal, a unified entity with two dimensions:

Personal dimension (comprehensive development): Following the theory of holistic human development, it aims to cultivate individuals with complete character and well-rounded qualities.

Social dimension (adaptation to needs): Reflecting the external laws of higher education, it focuses on cultivating talent that is needed by society, welcomed by enterprises, and immediately applicable.

(2) “2” Two Paths: Driven by the deep empowerment of AI technology, with interdisciplinary integration and deep industry-education integration as the pathways. This answers the core question of “how to cultivate people.” AI is not only a technical tool but also a catalyst for educational transformation, reshaping the entire process of knowledge production, dissemination, and application through intelligent technologies. Interdisciplinary integration provides the breadth and depth of knowledge, while industry-education integration offers practical fields and evaluative standards. AI empowerment infuses both with intelligent power, ensuring that talent cultivation is forward-thinking, practical, and irreplaceable.

Interdisciplinary integration: The AI-driven knowledge system revolution. Using AI technology to break traditional disciplinary barriers, designing personalized course combinations through intelligent recommendation systems, applying AI analysis tools to identify interdisciplinary knowledge connections, and creating intelligent “Three New Experimental Classes” (New Engineering, New Medical, New Liberal Arts). While promoting the integration of “engineering-management,” “medicine-management,” and “medicine-engineering,” AI thinking and data science methods are incorporated, cultivating students with interdisciplinary knowledge structures and AI-enhanced cross-disciplinary thinking to solve complex real-world problems in the intelligent era.

Deep integration of industry and education: Beyond simple school-enterprise cooperation, using AI to build a “Smart Industry-Education Community.” Through AI technology, the joint construction of intelligent industry academies, creation of digital twin internship bases, development of AI-driven dynamic curricula, and the introduction of industry mentors with AI literacy, AI-enabled real-world production services, smart technology standards, and digital projects are directly embedded in the talent cultivation process. This enables the deep integration and intelligent collaboration of the education chain, talent chain, industrial chain, and innovation chain, all supported by AI technology.

(3) “3” Three Orientations: Oriented towards local areas, grassroots, and the frontline, this defines our cultivation direction, clarifying the service focus of talent development and the primary battlefield for employment. It originates from the self-positioning of regional applied universities and their strong sense of social responsibility. It does not aim to cultivate “elite” individuals but focuses on training the backbone workforce for new urbanization, rural revitalization, and regional industrial development. This means that course design and practical activities must closely align with the actual needs of grassroots levels, cultivating students with the ability to “go down, stay, be useful, and perform well.”

(4) “4” Four Requirements: Cultivating high-quality applied technical talents with an applicable theoretical foundation, practical technical expertise, strong practical abilities, and good professional qualities. These are our talent development standards, defining the specific abilities and qualities expected of graduates, and serving as the ultimate output indicator for evaluating the quality of talent cultivation. These four requirements collectively form a complete profile of applied talent, avoiding the one-sidedness of “emphasizing skills over theory” or “emphasizing knowledge over qualities.” They ensure the sustainable development of talent cultivation and the ability to transition between careers.

Applicable theoretical foundation: Emphasizes “sufficient and practical” knowledge, rather than “broad and deep,” distinguishing it from research-oriented talent.

Practical technical expertise: Emphasizes “one specialization, many abilities,” allowing students to acquire solid, industry-recognized skills through the integration of “competitions, certifications, and courses.”

Strong practical abilities: Emphasizes the ability to “solve problems through hands-on experience,” which is the core focus of the entire teaching system.

Good professional qualities: Emphasizes "soft skills," including professional ethics, craftsmanship, teamwork, and communication skills, which are crucial for students' lifelong development.

In summary, the "AI+1234" talent development model is not merely a combination of numbers but a systematic and organic educational concept and action framework. Starting from the mission of regional applied universities, it profoundly addresses the fundamental questions of "What type of person should we cultivate, how should we cultivate them, and for whom should we cultivate them?"

5. Implementation plan based on "AI+1234" talent development model

This study utilizes the "AI+1234" top-level design to promote multi-party collaboration towards achieving the objectives. On the implementation level, the core strategies of "Team–Curriculum–Resources–Community–Think Tank" are used to promote deep cooperation across different backgrounds, disciplines, and institutions, forming a sustainable AI educational ecosystem. This ensures the effective accumulation, continuous optimization, and widespread dissemination of educational reform outcomes. The specific implementation methods of this paper are as follows:

5.1. "Build teams" to promote the "adaptive transformation" of teaching staff

The core of higher education lies in developing students' cognitive abilities, and this improvement directly depends on the depth and breadth of teachers' knowledge. The reform of teaching paradigms currently demands higher levels of literacy from teachers, which is key to the success of educational reforms. To address this challenge and drive the deeper development of vocational education reforms, efforts must begin with building teaching teams, gradually achieving the team's capability leap, thus providing the foundation for the intelligent transformation of teaching paradigms.

5.2. "Build curriculum" to promote the "intelligent transformation" of teaching models

To promote the "intelligent transformation" of teaching models, we accelerate the reform of training programs to reshape the talent competency framework in AI, progressively building up specialized learning. Specifically, curriculum development is aimed at meeting the demands of the AI era. The focus will not only be on updating teaching content but also on innovating teaching design. By reforming teaching design, we can integrate intelligent teaching tools such as knowledge graph systems, knowledge recommendation algorithms, personalized learning models, mastery algorithms for knowledge points, and big data analytics, all of which will drive and enhance the quality and effectiveness of education from a technological standpoint. The curriculum needs to deepen industry-education integration and explore a problem-oriented interdisciplinary talent cultivation model, shifting from a "knowledge-based" education philosophy to a "competency-based" approach.

In terms of curriculum content, we will incorporate the latest AI theories, skills, and applications into lesson plans, teaching materials, classroom instruction, and project-based practices. Additionally, a variety of teaching methods such as lectures, case studies, group discussions, and multimedia teaching will be employed. By using a mix of information resources and flexible approaches such as "listening," "speaking," and "understanding," we aim to stimulate students' interest and intrinsic motivation.

Furthermore, we will continuously monitor and emphasize the role of social feedback. By collecting and analyzing feedback from students, teachers, and various social sectors, we will continuously iterate and optimize curriculum content and teaching methods, ensuring that the intelligent transformation of the curriculum accurately understands, masters, expands, and deepens knowledge and skills in the AI field,

ultimately internalizing these into practice and providing high-quality information technology talent for various industries and communities in the region. This provides measurable teaching support for the "professionalization, digitalization" goals in "AI+1234."

5.3. "Build resources" to accelerate the "automated optimization" of teaching content

In the context of the information explosion, vast amounts of knowledge are readily available, yet quality teaching resources are still scarce. To accelerate the "automated optimization" of teaching content, building AI-based new forms of teaching resources becomes a critical foundation. By creating an intelligent platform that integrates resource sharing, course website management, teaching interaction, data analysis, and result presentation, we can continuously iterate and accumulate high-quality educational resources. At the same time, by incorporating local culture and educational resources, we will develop teaching content and case studies tailored to the needs of local students, further enhancing the relevance and practicality of resources. It is particularly worth emphasizing that the application of AI technology will also drive internal research within teaching teams through data collection, knowledge graphs, specialized knowledge bases, large model construction, and AI-enhanced retrieval. This will explore the automation of teaching content, ultimately creating an AI-defined resource ecosystem that feeds back into education. This will provide a solid foundation for the "digitalization, localization" goals in "AI+1234."

5.4. "Build community" to operate AI+ industry-education cooperation and practice alliances

To promote the "intelligent evolution" of teaching models, we will establish alliances and industry-education cooperation and practice communities, creating an intelligent education ecosystem (e.g., smart manufacturing, smart agriculture). This system starts by facilitating a comprehensive dialogue mechanism to promote the exchange of experiences between teachers and industry, ensuring alignment of goals and jointly exploring the integration of AI+ with higher education paradigms. It will also strengthen cooperation and communication with universities in the AI field for undergraduate talent development, participating in the formulation of cultivation goals and curriculum design. Based on this, we can explore teaching evaluation standards that integrate value shaping with professional capabilities, providing reliable feedback sources for the continuous iteration of teaching goals. Simultaneously, by integrating resources to design cross-disciplinary courses and leveraging social feedback for evaluation, we ensure a close alignment between teaching content and practical needs, thereby providing sustainable support for the "three orientations" (local, grassroots, frontline) in "AI+1234" and accelerating the transformation of research achievements into services for regional industries.

5.5. "Build think tanks" to study how AI can systematically empower education

To systematically empower education from a strategic standpoint, it is recommended to establish a think tank team, bringing together industry elites to promote the formation of AI knowledge systems and deeply study how AI technology can be deeply integrated with education. This process aims not only to explore how AI drives educational transformation through technological innovation but also to reflect this in practical applications throughout the teaching process. For example, reconstructing teacher-student relationships to enhance interactivity and adjusting the form of teaching resources to improve adaptability, laying the foundation for reshaping intelligent teaching models. Through think tank research, we can uncover the potential value of AI in the education field, proposing professional and forward-looking solutions and strategies, and providing

theoretical support for computer technology-driven educational decision-making. A spiral mechanism of "theoretical research– technological validation–strategy iteration" will be formed, ultimately providing a forward-looking and practical intellectual engine for the "professionalization, digitalization, and localization" goals in "AI+1234."

6. Research conclusions and summary of "AI+1234"

6.1. Research conclusions

This study constructs the theoretical framework of the "AI+1234" talent development model, aiming to promote the deep integration of AI technology in applied undergraduate education. Through systematic analysis and step-by-step progression, the following research conclusions were drawn:

(1) Reshaping the competency structure of applied undergraduate talent through AI technology

AI technology, through personalized learning pathways and precise teaching interventions, can significantly enhance students' professional skills, while also fostering their innovation thinking, critical thinking, and ability to solve complex problems. AI-enabled teaching models will effectively drive a profound transformation in the competency structure of applied undergraduate talent, enhancing students' ability to learn independently, collaborate, and adapt, while improving their overall competence and versatility.

(2) Data-driven optimization of applied undergraduate talent development strategiehrough real-time monitoring of students' learning processes and big data analysis, AI technology can provide detailed learning analysis reports for teachers, helping them accurately grasp students' learning needs and potential risks. Data-driven teaching models will significantly improve teaching quality, optimizing the strategies for applied undergraduate talent development and enhancing the precision and effectiveness of education.

(3) Effective alignment between job requirements and curriculum teaching objectivehe application of AI technology will help dynamically adjust and optimize curriculum content, providing timely feedback on industry and enterprise needs, thus making curriculum design more aligned with actual job requirements. AI support will enhance the specificity and effectiveness of teaching, making the alignment between curriculum content and job skills more seamless, ensuring that applied undergraduate education produces talents that meet market demands.

(4) Seamless integration of school education and employment goalI-powered simulated work scenarios and project-driven learning will allow students to acquire practical experience closely aligned with real-world work environments, ensuring they can seamlessly transition to meet job market demands upon graduation. Additionally, an AI-based career planning system, using employment market analysis, will provide students with personalized career guidance and development advice, further ensuring close alignment between school education and the job market.

(5) Building a collaborative ecosystem for talent development in applied undergraduate educatiohe application of AI technology will promote deep collaboration between universities, teachers, students, and enterprises, forming a collaborative ecosystem for talent cultivation. Through intelligent education platforms, universities and enterprises can share real-time workforce needs and teaching content, while students can engage in industry collaboration through practical projects. The deep integration of industry, academia, and research will drive innovation and development in applied undergraduate education, enhancing its practical relevance and market adaptability.

6.2. Summary

The transformation of teaching models in regional applied universities through AI empowerment is a systematic and long-term reform initiative, requiring both theoretical innovation and practical exploration, as well as parallel development of technological applications and institutional frameworks. The "1234 Talent Development" model proposed in this study provides new ideas for the reform and innovation of applied undergraduate education, offering valuable insights for the long-term development of the education sector.

Looking ahead, as AI technology continues to evolve, a key future research task will be how to more effectively integrate AI into various disciplines and teaching processes to further enhance educational quality and the effectiveness of talent development. We must continue to advance the deep integration of AI technology with higher education, adopting a more open perspective, pragmatic attitude, and innovative spirit to cultivate high-quality applied talents that meet the demands of the new era. Only in this way can we truly achieve the grand goal of educational modernization and provide strong talent support for societal development.

At the same time, we must recognize that technology is merely a tool. The essence of education lies in cultivating, developing, and perfecting individuals. In advancing AI-driven educational reforms, we must always adhere to a people-centered educational philosophy, ensuring that technology serves the comprehensive development of individuals and fulfills the fundamental mission and value pursuit of education.

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Disclosure statement

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