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Original article

RESEARCH ON THE INTEGRATION OF EDUCATION, TECHNOLOGY AND TALENT DEVELOPMENT IN ARTIFICIAL INTELLIGENCE UNDER THE PERSPECTIVE OF NEW QUALITY PRODUCTIVE FORCES

INVESTIGACIÓN SOBRE LA INTEGRACIÓN DE LA EDUCACIÓN, LA TECNOLOGÍA Y EL DESARROLLO DEL TALENTO EN LA INTELIGENCIA ARTIFICIAL BAJO LA PERSPECTIVA DE LAS NUEVAS FUERZAS PRODUCTIVAS DE CALIDAD

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Abstract

This paper elucidates the roles of education, technology and talent, and investigates the relationships among them. It highlights that education is fundamental, technology crucial, and talent the cornerstone. University serves as the basic units, academic disciplines as the optimal intersection points, and innovation is identified as the common denominator. Drawing on practical experiments on the integration of education, technology, and talent development conducted in Beijing Institute of Technology (BIT), this paper introduces the integration of the institute's AI-based educational system ChatBIT, which is

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designed to be controllable and trustworthy, and analyzes how AI is driving educational revolution. Finally, it proposes a strategy for the integrated development of education, technology and talent in the AI field, emphasizing strategic leadership by aligning with national needs and strengthening foundational research, system restructuring by breaking down disciplinary barriers to unleash original innovation, and innovative practice by integrating the transformation chain to create a high ground for cultivating outstanding talents.

Keywords: artificial intelligence, new quality productivities forces, education, science and technology, and talents.

Resumen

Este artículo explica el papel de la educación, la tecnología y el talento, e investiga sus relaciones. Destaca que la educación es fundamental, la tecnología crucial y el talento la piedra angular. La universidad funciona como unidad básica, las disciplinas académicas como puntos de intersección óptimos y la innovación se identifica como el denominador común. Basándose en experimentos prácticos sobre la integración de la educación, la tecnología y el desarrollo del talento realizados en el Instituto de Tecnología de Beijing (BIT), este artículo presenta la integración del sistema educativo basado en IA ChatBIT del instituto, diseñado para ser controlable y confiable, y analiza cómo la IA está impulsando la revolución educativa. Finalmente, propone una estrategia para el desarrollo integrado de la educación, la tecnología y el talento en el campo de la IA, enfatizando el liderazgo estratégico mediante la alineación con las necesidades nacionales y el fortalecimiento de la investigación fundamental, la reestructuración del sistema mediante la eliminación de barreras disciplinarias para impulsar la innovación original, y la práctica innovadora mediante la integración de la cadena de transformación para crear una base sólida para cultivar talentos excepcionales.

Palabras clave: inteligencia artificial, nuevas fuerzas de productividad de calidad, educación, ciencia y tecnología y talentos.

Introduction

The report to the 20th National Congress of the Communist Party of China (CPC) states, “Education, science and technology, and talent are the foundational and strategic supports for building a modern socialist country. We must uphold that science and technology is the primary productive force, talent is the primary resource, and innovation is the primary driver.” The Third Plenary Session of the 20th CPC Central Committee further emphasized, “We must coordinate the reform of education, science and technology, and talent systems and mechanisms, improve the new national system, and enhance the overall effectiveness of the national innovation system”.

At the 2024 National Education Conference, President Xi Jinping reiterated the need to “implement the strategies for invigorating the country through science and education, strengthening the country with talent, and driving development through innovation in a coordinated manner, and to promote the integrated development of education, scientific and technological innovation, and talent cultivation”. These strategic deployments highlight the high importance attached by the CPC Central Committee with

Xi Jinping at its core to the synergy among education, science and technology, and talent. They also set higher standards for universities to deeply understand the intrinsic logic of the coordinated relationship and to facilitate a virtuous cycle among the three domains.

On January 31, 2024, President Xi Jinping delivered an important speech during the 11th collective study session of the CPC Central Committee Political Bureau. In his speech, he systematically explained the scientific connotations of new quality productive forces, highlighted their significant importance, and set clear requirements for their development. President Xi Jinping emphasized that "developing new quality productive forces is an intrinsic necessity and a key focus for promoting high-quality development. We must continue to innovate and accelerate the development of new quality productive forces".

President Xi Jinping also emphasized the need to promote a virtuous cycle of education, science and technology, and talent in line with the requirements for developing new quality productive forces. This involves improving mechanisms for talent cultivation, recruitment, utilization, and rational mobility. By promoting a "virtuous cycle", we can advance the integrated development of education, science and technology, and talent. Education is the crucial foundation for developing new quality productive forces, scientific and technological innovation is the core element, and talent is the primary resource. These three elements form a mutually reinforcing ecosystem: education nurtures talent, talent drives scientific and technological innovation, and scientific and technological innovation, in turn, promotes educational development. Accurately understanding their dynamic relationship is essential for building and sustaining a smooth virtuous cycle.[1]

Zhang Jun (2024) argues that accelerating the development of new productive forces imposes new tasks and requirements on higher education in the new era. To accelerate this development, universities must enhance the quality of talent cultivation and focus on nurturing outstanding innovative talents with original creativity. Furthermore, they should expedite the promotion of original and disruptive scientific and technological innovations to support national self-reliance and strength in high-level science and technology. Additionally, they should facilitate the practical application of scientific and technological breakthrough and accelerate the transformation of research outcomes into advanced productive forces.[2]

The new quality productive forces are spurred by revolutionary breakthroughs in technology, innovative allocation of production factors, and deep industrial transformation and upgrading. In recent years, artificial intelligence (AI) has rapidly developed, becoming a powerful force driving the rapid formation of new quality productive forces.[3] President Xi Jinping emphasized: "Accelerating the development of a new generation of artificial intelligence is a crucial strategic tool for us to secure an advantage in global technological competition. It is also an important strategic resource for promoting the leapfrog development of science and technology, industrial optimization and upgrading, and the overall enhancement of productive forces". He further noted, "China places great importance on the development of artificial intelligence, actively promoting the deep integration of the Internet, big data, artificial intelligence, and the real economy. We are cultivating and strengthening the intelligent industry, accelerating the development of new quality productive forces, and providing new impetus for high-quality development". The Central Economic Work Conference held at the end of last year proposed to "launch the 'AI+' initiative to foster future industries". It is therefore imperative to seize the significant strategic opportunity, build a first-mover advantage in China's AI development, accelerate the formation

of new quality productive forces through AI-driven innovation. These efforts will not only serve economic and social development but also reinforce national security, and effectively promote the construction of Chinese-style modernization.[4]

High-level research universities, as key hubs for education, science and technology, and talent, are crucial for fostering the AI development. They are also the core drivers in advancing new quality productive forces. These institutions must align closely with the cutting-edge advancements in AI and the strategic needs of the nation. They should continuously deepen comprehensive reforms, optimize mechanisms for scientific and technological innovation, focus on cultivating top-tier AI talents independently, and strengthen the development of high-level academic teams dedicated to AI research and education. By leveraging the strong technological impetus of AI, these universities can lay a solid foundation for the development of new quality productive forces and fully support the realization of Chinese-style modernization.

This study aims to explore the mechanisms and practical approaches of artificial intelligence in empowering the integrated development of education, technology, and talent. The research framework focuses on the specific applications of AI in these three areas, analyzing how AI promotes their coordinated development. The core argument is that AI can break down the barriers between education, technology, and talent, creating an organic and mutually reinforcing ecosystem, thereby driving the development of new quality productive forces.

Positioning and Interrelation of Education, Science and Technology, and Talent

Education is the foundation for building a strong nation and achieving national rejuvenation. Science and technology are the primary productive forces, talent is the primary resource, and innovation is the primary driver. In his speech at the National Science and Technology Conference, the National Science and Technology Awards Conference, and the Chinese Academy of Sciences and Chinese Academy of Engineering Joint Conference on June 24, 2024, President Xi Jinping emphasized that scientific and technological innovation relies on talent, talent development depends on education, and education, science and technology, and talent are inherently consistent and mutually supportive. President Xi called for efforts to promote a virtuous cycle among these three domains, and to coordinate the implementation of the strategies for invigorating the country through science and education, strengthening the country with talent, and driving development through innovation. These strategies must be advanced in an integrated and unified manner.

Many experts and scholars have shared their views on the positioning and interrelation of education, technology and talent. Some emphasize that education serves as the foundation, providing intellectual support for technological advancement and talent development; science and technology acts as the driving force, propelling educational innovation and industrial upgrading; talent is the key, serving as both the target of educational cultivation and the core agent of innovation.[5] Others highlight that education lays the groundwork for both innovation and talent development, technology guides the enhancement of educational quality and talent cultivation, and talent occupies the central role in driving progress in both areas.[6]

Some scholars also note that education is the foundation, technology is the key, and talents are the essence; education focuses on nurturing talents, and the strength of education fosters the strength of talent, providing a continuous supply of talent for technological progress; in turn, the primary goal of scientific and technological innovation is to further advance productive forces, which requires robust educational support and also feeds back into educational reform, serving as a significant driving force for talent cultivation; from this perspective, human beings are the most dynamic factor in productive forces, and innovation-driven development is essentially talent-driven.[7]

Furthermore, scholars point out that education is a vital foundation for developing new quality productive forces, scientific and technological innovation is the core element, and talents are the primary resource; in this dynamic, education cultivates talents, who then drive scientific and technological innovation, which in turn promotes educational development.[8] Zhang Jun (2024) offers a comprehensive interpretation of this relationship, stating that education is fundamental, science and technology are key, and talents are foundational. He also notes that universities are the basic operational units, disciplines are the optimal points of intersection, and innovation is the greatest common denominator among them, as illustrated in **Figure 1**.[9]

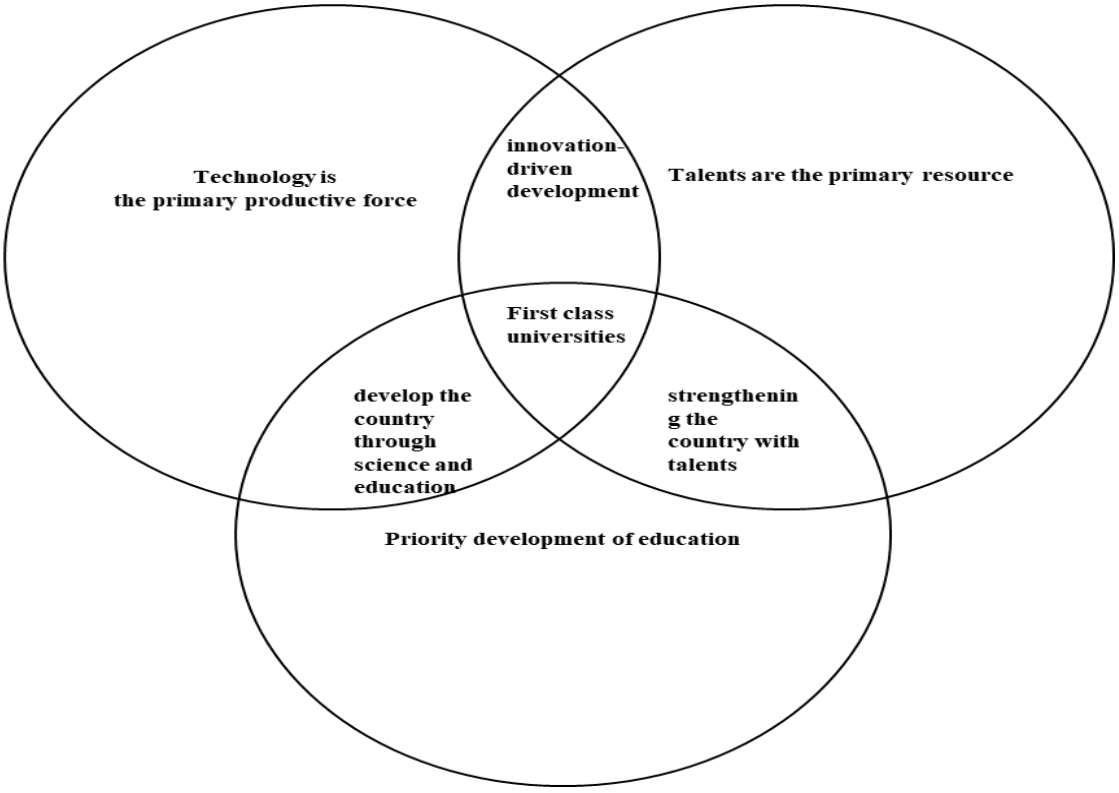

Figure 1. Integrated Framework of Education, Science and Technology, and Talents
Source: own elaboration

Taking the artificial intelligence discipline at Beijing Institute of Technology (BIT) as an example, the integration of education, research and talent development can be elaborated as follows: education serves as foundation, developing a comprehensive, interdisciplinary AI education system; science and

technology function as the key producing autonomous, secure, and controllable AI technologies; talent is the basis, cultivating versatile value-creating professionals with human-machine symbiotic intelligence. The integration of technology and education drives educational transformation through AI; the coordinated development of technology and talent leads to paradigm shifts in research through AI; and the synergy between education and talent empowers industrial development through AI. The following parts present BIT's experience from three perspectives: the construction of an integrated AI education system, research on autonomous, secure, and controllable AI technologies, and the educational transformation enabled by AI.

Developing an Integrated Artificial Intelligence Education System

The fundamental mission of education is to cultivate the soul, enlighten the mind and nourish the heart. It should not only impart knowledge and skills, but also shape character and foster values.
President Xi Jinping emphasized that, as a new technology and field, artificial intelligence requires strong policy support. It is essential to integrate policies such as intellectual property rights, fiscal and tax incentives, government procurement, and public facilities openness to promote the development of science and technology finance. Efforts should be made to advance AI education across all educational levels and foster AI literacy throughout society, to continuously cultivate high-quality talent. Additionally, it is necessary to improve the mechanisms for supporting AI research, providing career support, and evaluating talent, in order to create platforms and conditions for various talents to thrive.

Developing an integrated AI education system involves organically integrating AI education with other disciplines, such as mathematics, natural sciences, humanities, and social sciences. This interdisciplinary integration promotes mutual enrichment and coordinated development, broadens students' knowledge base while cultivating talents with the cross-disciplinary literacy and practical competence to solve complex problems. It serves for the fundamental goal of education, which is to support the all-round development of students.

To help students better engage with the digital-intelligent education, BIT has meticulously designed four major types of AI-related courses: General Education, Empowerment, Application, and Specialization. The university has adopted a strategy that includes modular course selection ("classified + tiered"), flexible course design ("integrated + innovative"), and differentiated teaching delivery ("foundational + scenario-based"), ensuring comprehensive coverage and integrated training from undergraduate to graduate levels. The **Table 1** shows types of AI courses.

Type of talent	**course content**			
	AI Thinking	AI Knowledge	AI Algorithms	AI Innovation
General (Humanities)	√			
Applied (Social Sciences)	√	√	√	
Empowerment (Science, Technology, Engineering, Mathematics)	√	√	√	
Specialized (Information Sciences)	√	√	√	√

Table 1. Types of AI courses
Source: own elaboration

To cultivate specialized AI professionals, BIT has established an "Intelligence Class" at Xu Teli College to nurture outstanding and innovative talents in the field of AI. As one of the earliest institutions selected for national-level initiatives, including the co-construction of national AI colleges, the AI industry-education integration platform, the collaborative education base for autonomous intelligent robotics, the AI undergraduate program, and the only basic science center for AI (F06), Beijing Institute of Technology leverages 12 pioneering national platforms to build a high-standard AI college. The "Intelligence Class" follows an integrated training system spanning undergraduate to doctoral education. The AI College at BIT offers five academic directions: AI theory, brain-inspired intelligence, swarm intelligence, intelligent security and counterintelligence, and intelligent technology and applications. It emphasizes interdisciplinary foundations, leveraging top-ranked (A+) disciplines such as weaponry and control science to deeply integrate AI theory with professional application scenarios like marine technology and aerospace information, and moreover, students can engage in practical training at national key laboratories and other national experimental platforms. The college also focuses on industry-academia integration, utilizing 10 joint laboratories co-built with companies like Huawei and Baidu, and four practical training platforms for AI + Chips, AI + Big Data, AI + Large Language models, and AI + Systems. The college adopts an iterative empowerment approach of "theoretical teaching, scenario dissection, and engineering feedback" to cultivate elite interdisciplinary talents for the national AI development.

Beijing Institute of Technology employs a "Four Integrations and Four Flexibilities" strategy to achieve personalized and adaptive development for students. Specifically, this involves the integration of disciplines and majors, colleges and academies, campuses in different regions, and domestic and international environments. Flexibility is also embedded into academic systems, courses, credits, and training programs. During the learning process, students are encouraged to explore actively, take risks, and learn from trial and error, thus removing the barriers to innovation and exploration.

The teaching mode developed by the authors' team is shown in **Figure 2**, which features a diversified teaching faculty, heterogeneous student body, rich platform resources, a flipped-classroom structure and comprehensive evaluation systems.

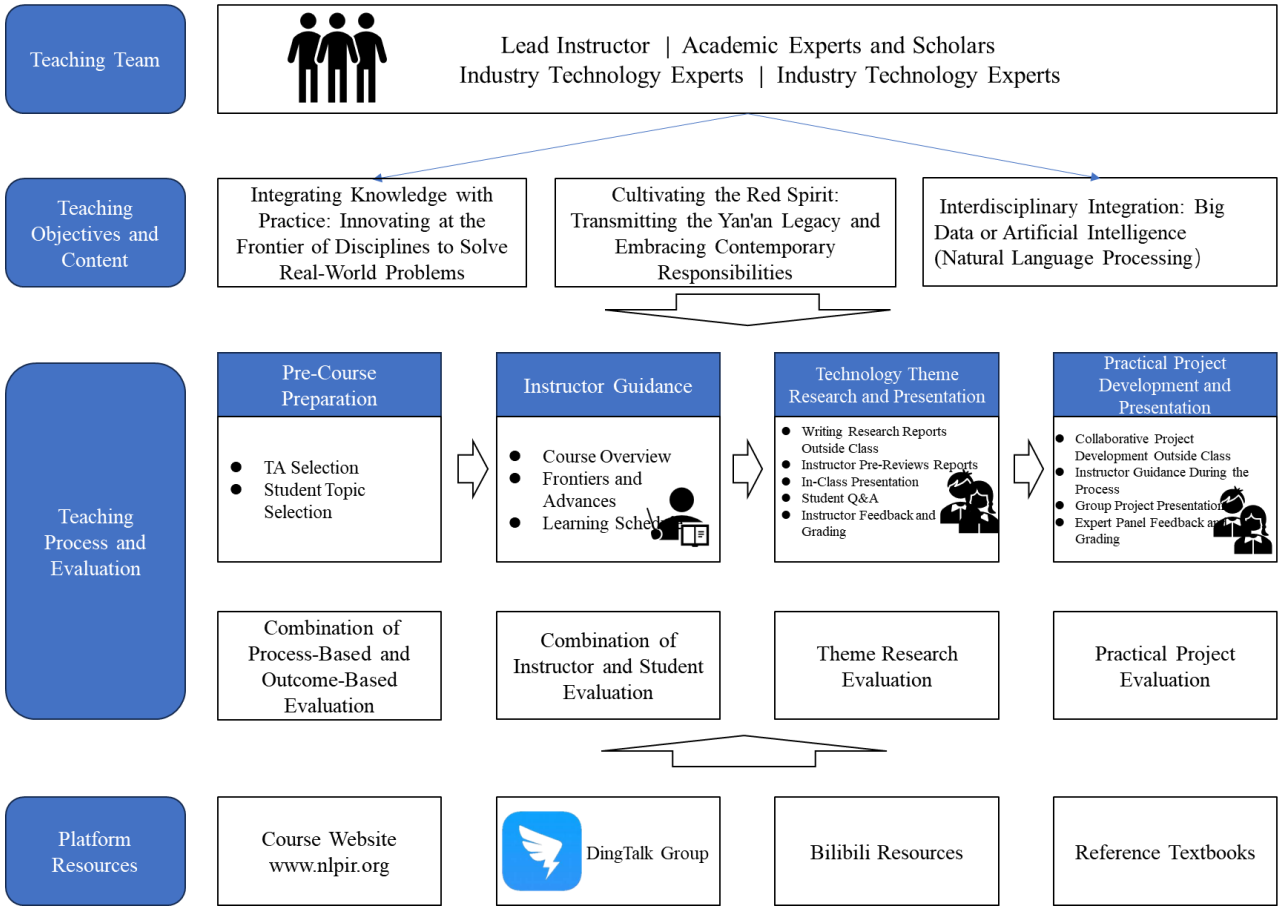

Figure 2. Teaching Model Based on Flipped Classroom and Project-Based Learning
Source: own elaboration

Independent, Safe and Controllable Achievements in Artificial Intelligence

President Xi Jinping emphasized that to gain a leading edge in the field of artificial intelligence, breakthroughs must be made in foundational theories, methods, and tools. It is essential to continuously strengthen fundamental research, focusing on overcoming core technologies such as high-end chips and foundational software, to build an AI system that is both self-reliant and collaboratively operational. By leading the transformation of scientific research paradigms with artificial intelligence, we can accelerate technological innovation across diverse fields.

In recent years, driven by policy guidance, technological advancements, and industrial applications, China has made significant progress in AI development.[10] Significant breakthroughs have been achieved, particularly in areas such as speech recognition, image processing, intelligent manufacturing, and autonomous driving–areas where China holds a global leadership position. In recent years, China has accelerated the construction of new information infrastructure, laying a solid foundation for AI development. By the end of November 2024, China had built 4.191 million 5G base stations, serving over 1.002 billion 5G users, forming the world's largest 5G network. This has provided a rich foundation of technology, data, industry, scenarios, and market for AI development. In terms of R&D, AI-driven

innovation and application have not only optimized algorithmic technologies but also enabled breakthroughs in intelligent chips and hardware systems. According to the World Intellectual Property Organization statistics, from 2014 to 2023, China filed over 38,000 patent applications for generative AI, ranking first globally. Currently, China has initially established a comprehensive AI industry system, covering key links across the value chain, including chips, algorithms, data, platforms, and applications. Several large-scale AI models developed by China have been widely applied in areas such as transportation, e-commerce, and digital learning.

There remains a significant gap between China and Western countries in areas such as AI chip manufacturing, industrialization maturity, investment and financing, and open-source development. Lithography machines, crucial in chip manufacturing, represent a bottleneck, since China lags behind ASML, a Dutch company dominant in the lithography market. In 2023, Shanghai Micro Electronics Equipment (SMEE) Group, a leading Chinese lithography developer, announced the successful development of a 28-nanometer lithography machine, while ASML almost monopolizes the global EUV lithography machine market, supplying TSMC, Intel, and other companies with its 2-nanometer capabilities. In terms of industrialization and investment, the United States still holds a commanding lead, while China, despite rapid progress, is still in the catch-up phase. From 2013 to 2024, the number of AI startups established in the U.S. (6,956) was approximately 4.3 times that of China (1,603). The total private AI investment in the U.S. was $470.9 billion, compared to $119.3 billion in China. GitHub, the world's largest open-source code hosting platform, is often used as a key indicator of algorithm research and technological innovation: in 2024, developers from the U.S. contributed 23.4% of GitHub AI projects, while those from China contributed only 2.08%.

Looking to the future, China's AI technology should aim to develop a systematic capability in domestically produced AI and foster an innovative ecosystem of military-civilian integration. By focusing on the Huawei HarmonyOS and the Ascend computing ecosystem, we should gradually build a self-reliant domestic AI technology chain, from GPU chips and operating systems to upper-layer application ecosystems, thus forming a comprehensive breakthrough capability. As demonstrated in geopolitical scenarios such as the India-Pakistan conflict, isolated technological breakthroughs are insufficient to change the overall landscape; only through systematic and coordinated innovations can we gain the upper hand in international technological competition. The construction of an AI innovation ecosystem requires a positive interaction between talent, technology, industry-academia collaboration, and national infrastructure development. Through high-level talent cultivation, key technology breakthroughs, collaborative innovation in research and industry, and support from intelligent computing infrastructure and data platforms, China can form a complete, efficient, and sustainable AI development system, promoting high-quality and autonomous AI development.

Below is an introduction to the work of the NLPIR Laboratory at BIT, which is dedicated to achieving autonomous, secure, and controllable AI technology. The NLPIR Semantic Cognitive Security Laboratory is positioned as a world-class center for big data, multilingual semantic cognitive security innovation, serving national security governance, industry-level data mining, and personal intelligent services. The laboratory is led by Academician Zhang Jun, the Party Secretary of BIT, who serves as the Chairman of the Academic Committee, with Academician Wushouer·Silamu as the Chief Scientist. Academicians Ni Guangnan and several military generals serve as advisory scientists. Currently, the

laboratory has 20 full-time faculty members, including one national-level leading talent in science and technology and four senior defense professionals. The laboratory focuses on five areas: Chinese natural language processing, multilingual intelligent information processing, large language dialogue models, intelligence analysis, and document intelligent analysis, as detailed below:

1. In terms of Chinese natural language processing: NLPIR Chinese Semantic Intelligent Processing Platform integrates Chinese word segmentation, named entity recognition, new word discovery, keyword extraction, text classification and clustering, sensitive content filtering and scanning, document parsing and other functions. With an accuracy rate above 90%, the platform won the First Prize of Qian Weichang Chinese Information Processing Science and Technology Award;
2. Intelligent multilingual information processing: Currently, it covers natural language processing and machine translation of for several "Belt and Road" languages such as Chinese, English, French, Uighur, Cantonese dialect, Indonesian, Arabic, Indian Urdu, Togo language and Tibetan (integration pending);
3. In terms of large language dialogue model: The self-developed *ChatBIT* large language model overcomes the defects of ChatGPT, such as reliability, controllability and cost effectiveness, and offers a trustworthy, agile and controllable alternative. It has won the Zhiyan Cup Award for Large Models;
4. In terms of intelligence analysis: The ZhiMeng Intelligence Production Line System integrates three core functions: intelligence perception, cognition, and generation. It covers both open-source and internal intelligence, with a built-in knowledge graph over 100,000 entries on equipment, personnel, and organizations, enabling the creation of entity, relationship, and event graphs. This system can be applied to the analysis of public opinion, scientific and technological intelligence, and military intelligence;
5. In terms of document intelligent analysis: automatic proofreading, verification and generation of documents are realized, including classified document drafting, report summarization, automatic generation of daily and special reports, and the format and content review of official documents.

AI-Powered Educational Transformation

To fully harness the potential of emerging technologies, such as artificial intelligence, it is essential to reshape and restructure the higher education landscape, and to accelerate the integrated development of education, science and technology, and talent. This requires a focus on fundamental and leading issues, with higher education taking on the historical responsibility of talent cultivation. By making key strategic moves, we an drive a comprehensive breakthrough in high-quality development, ensuring a dynamic and synergistic advancement of education, science and technology, and talent.[11]

With the comprehensive development and application of AI technology, Beijing Institute of Technology has designated 2025 as the "Year of AI at BIT" to foster a vibrant culture of AI adoption and to empower the intelligent transformation across all areas of the school, This year, the university is delivering multi-level and comprehensive AI empowerment through its self-developed large language model *ChatBIT*, offering AI applications, models, and computing power to all faculty, students, colleges, and departments. "AI empowerment" involves the integration of AI into various industries, products, or services, thereby enhancing efficiency, optimizing user experience, and creating new value. The core of this approach is

to integrate AI technology with real-world scenarios to address complex issues that traditional methods cannot handle. The essence of AI empowerment is the instrumentalization of technology, with the ultimate goal of serving BIT's research, teaching, and other needs. Efforts will be made in areas such as intelligent campus governance, intelligent teaching and learning, and AI research, applying AI technology to every aspect of the school to enhance its overall strength.

(i) Value Formation: Digitalizing Ideological and Political Education

Value creation is a significant advantage and distinctive feature of higher education in China. By advancing digital transformation, we can continuously refine and innovate ideological education to enhance its appeal. Focusing on the studying and implementing Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, we emphasize deep understanding through the influence of "red culture", and leverage emerging technologies such as the Internet, big data, and AI to expand the content, forms, and platforms of ideological and political education. This approach makes ideological and political education more engaging and impactful.

Beijing Institute of Technology has developed a *ChatBIT*-based school history Q&A system, creating an immersive and intelligent interactive experience of the school's heritage. By integrating technologies such as natural language processing (NLP), computer vision (CV), and knowledge graphs, AI has transformed the school history search from a "one-way retrieval" to a "multimodal dialogue". This allows teachers and students to interact with historical materials through various means, including text, voice, and images, thus creating a more vivid and convenient platform for Beijing Institute of Technology's historical and cultural dissemination. The core features include multimodal input querying, supporting text-based questions, voice queries, image searches, and mixed inputs. For example, users can ask, "What national awards did the school win in 2024?" or dictate, "Who were the first three presidents of Beijing Institute of Technology?" or upload old photos of the school, and the system will tell the stories behind these images. Intelligent responses and recommendations can provide precise answers and associative suggestions. Immersive displays use AR technology to create a virtual tour of the school's history, where the phone camera can recognize real campus buildings and historical images are overlaid for comparison. This feature is applied to the school archives, offering visitors a rich and three-dimensional understanding of the school's history, and can be expanded to include introductions to laboratories and products.

(ii) Knowledge Cultivation: Digitalizing the Training System

BIT is committed to creating a "five-dimensional education" that integrates spatial, temporal, and cognitive dimensions. In the spatial dimension, leveraging smart internet technology, we will gradually promote the online presence of renowned teachers and courses, standardize online teaching, create flipped classrooms, and build smart classrooms. This approach aims to reshape the relationship among people, machines, objects, and the environment, enabling learning accessible anytime and anywhere. In the temporal dimension, through virtual teachers, classrooms, and teaching equipment, we will facilitate students' engagement with course content at all times, enabling them to connect with peers worldwide, thus creating a ubiquitous, efficient, and learning environment. In the knowledge (cognitive) dimension, using knowledge graphs, we will link students' knowledge elements, chains, and areas, constructing a knowledge space to facilitate mutual learning, integration, and linkage of knowledge, breaking down

barriers between disciplines and professions, and promoting a knowledge-driven system where everyone can learn. Beijing Institute of Technology has developed a digital education platform centered around the "Joyful Learning Platform", integrating expert-led instruction, intelligent technology, and innovative educational practices, to achieve collaborative learning and growth among the community.

As illustrated in **Figure 3**, this diagram illustrates the AI-empowered teaching system. It revolves around a triangular framework of "teaching, learning, and management", integrating four key stages: design, implementation, evaluation, and feedback. In the design stage, knowledge graphs are used to digitally construct training programs, develop smart courses and digital textbooks, and personalize teaching plans, setting the direction for instruction. In the implementation stage, the entire platform leverages AI + courses and textbooks, adopting an AI-assisted learning model to facilitate personalized and immersive learning, thereby implementing teaching activities. In the evaluation stage, intelligent analysis and assessment are conducted based on competency and literacy maps to accurately evaluate learning outcomes. In the feedback stage, intelligent supervision (competency maps) is used to conduct comprehensive evaluations, tracking, and feedback through AI-assisted management, which refines teaching strategies, forming a closed loop of "design-implementation-evaluation-feedback-redesign." This process supports continuous teaching optimization and meets personalized learning needs.

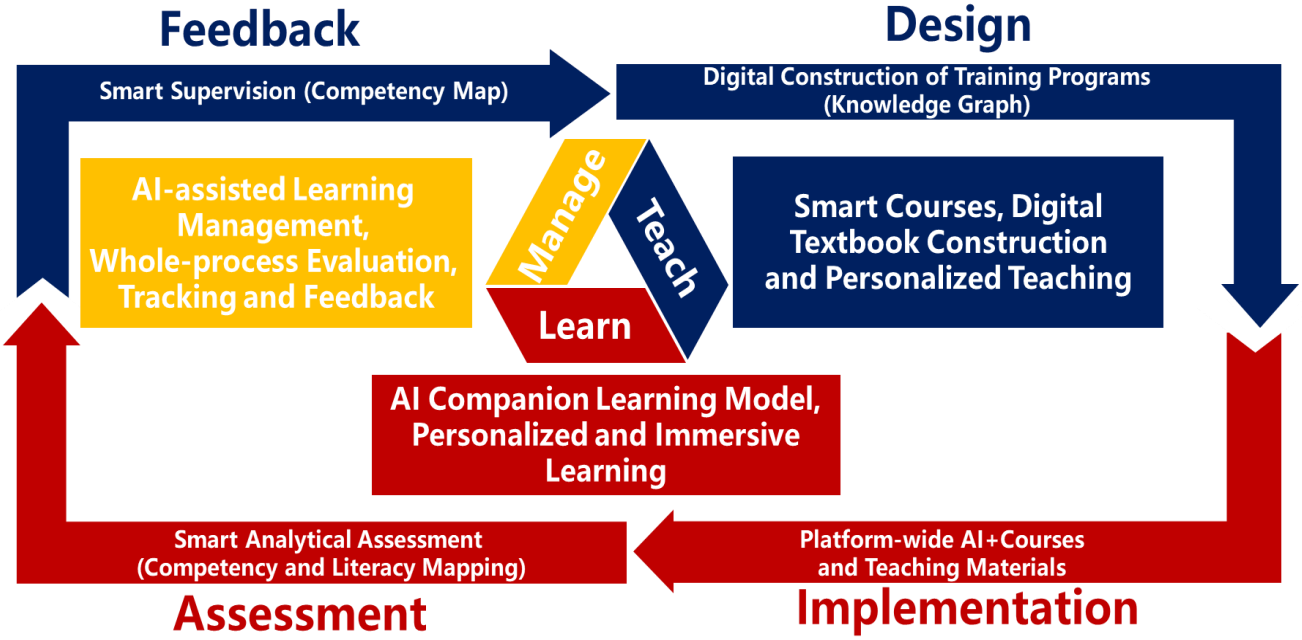

Figure 3. Digital Framework of the AI-Enabled Training System
Source: own elaboration

Beijing Institute of Technology has developed a thesis review platform based on the *ChatBIT* large model, primarily targeting students at the university. The application is supported by the Graduate School and the Academic Affairs Office, aiming to provide efficient and intelligent assistance for thesis review. The platform is built using fine-tuning techniques on large language models, with instructions fine-tuned to better adapt to the linguistic style and review requirements of academic writing. Building on this, the

platform integrates Agent technology to streamline and modularize the thesis processing workflow, achieving an automated chain from text input to review feedback. Leveraging the powerful capabilities of the *ChatBIT* model in natural language processing, the platform offers four core functions: sentence similarity analysis, typo correction, overall modification suggestions, and chapter-by-chapter modification recommendations. Through semantic understanding and context modeling, the platform can automatically identify repetitive content and redundant expressions in the thesis, enhancing its originality. Additionally, drawing on the large model's language error-correction capability, it effectively detects and fixes spelling and lexical usage errors, ensuring the linguistic standardization of the thesis.

Furthermore, the platform incorporates a context-aware text reconstruction mechanism, which can propose macro-level modifications such as structural optimization and logical coherence improvements for the entire thesis, as well as detailed revision suggestions for each chapter, from the research background and methodology to experimental results, thereby enhancing the systematic structure and scientific rigor of the thesis content. The system has been deployed on the thesis service platform for students, demonstrating strong practicability and expansibility. It provides intelligent solutions for thesis writing and evaluation in higher education, and significantly reduces the communication cost between faculty and students and lowering the time investment in manuscript revisions.

(iii) AI-Driven Party Building

AI-empowered Party building involves leveraging AI to enhance the intelligence, precision, and efficiency of Party-related activities, thereby promoting the deep integration of Party building with digitalization. AI technology can optimize various aspects, including Party member education, organizational management, decision-making support, and publicity guidance, thus achieving an innovative upgrade in Party governance.

Beijing Institute of Technology has developed and implemented an intelligent Party-building platform based on the *ChatBIT* large model. The system features core functions including Party building knowledge Q&A and ideological and political education. By integrating resources such as *the Constitution of the Communist Party of China*, historical Party documents, and the Theory of Socialism with Chinese Characteristics in the New Era, and leveraging the Retrieval-Augmented Generation (RAG) technology of the large model, the system can accurately interpret user queries and provide services such as policy interpretation, guidance on Party affairs procedures, and theoretical learning. For example, it can answer complex questions like “What are the specific requirements for developing new party members” and “How to understand the concept of common prosperity”. This creates a comprehensive intelligent knowledge base for Party workers and Party members. Additionally, the system offers data management and visualization analysis. In the context of university department management, it utilizes the NL2SQL (Natural Language to Structured Query Language) capability of the *ChatBIT* large model to automatically convert user commands into structured queries. For instance, when users input “Employment rate of computer science graduates over the past three years” or “Display Professor Li Hua's research project list”, the system can directly access the college database, generate visualizations such as bar charts and pie charts using the Streamlit framework, and support multi-dimensional displays of faculty data, including teaching achievements, research projects, and social services, significantly enhancing data management efficiency.

The applicable departments and scenarios include: the College Party Committee department for disseminating Party affairs knowledge, training Party members, and interpreting policy documents, to support standardized and regulated Party-building activities; the administrative offices of secondary colleges help teaching units like the School of Computer Science quickly access faculty research outcomes and students' employment data, supporting talent assessment and academic management; the Career Guidance Center uses visual analysis to track graduate employment trends, providing data support for optimizing academic programs and formulating employment policies.

(iv) AI-Driven Campus Services

With the rapid development of society and universities, "parking difficulties" have become a common issue for vehicle owners and campus administrators. To address issues such as limited parking availability, disorderly vehicle placement, and the occupation of many parking spaces by long-term unused vehicles, AI technology has been introduced. This technology optimizes the utilization of parking resources and solves parking problems through intelligent perception, dynamic scheduling, and unmanned operations. The system, based on the *ChatBIT* large model, provides data-driven recommendations for parking analysis and planning management solutions. Parking data is sourced from parking management companies and can be imported weekly, monthly, or annually. Using fine-tuned large language models and external knowledge bases, combined with other statistical analysis techniques, the system offers reasonable suggestions to assist the school's logistics department in effective parking planning and management. The main functions include: addressing the problem of abandoned vehicles through data analysis, screening out long-term occupied parking spaces according to predetermined rules, assisting the security department in taking follow-up actions, thereby reallocating parking spaces for faculty and staff with actual needs; formulating dynamic, off-peak pricing strategies by region: analyzing parking spaces usage patterns to identify idle time periods (such as lunch breaks and nights), offering a 30% fee discount for parking during these times to encourage staggered parking, balancing the supply and demand of parking spaces; establishing a credit-based evaluation system: assigning credit scores to vehicles based on bonus and penalty criteria, offering incentives such as reserved parking spaces, priority selection of spots, and parking fee discounts to high scoring vehicles while imposing restrictions, such as limited campus access, automatic manual review upon entry, and increased parking fees on low-scoring ones; implementing a tiered charging policy: set a "base parking duration" (e.g., 9 hours/day), and charge 3 yuan per hour for any time beyond that to prevent prolonged occupation. For vehicles parked for more than 30 days, a late fee will be added. Analyze the parking distribution data by week, month, and year, focusing on peak and idle periods, and distinguishing between monthly pass holders and temporary parkers.

The university laboratory undertakes numerous high-risk research tasks in fields such as chemistry, materials science, and energy. The lab often houses flammable and explosive chemicals, high-temperature equipment, and precision instruments, creating a complex and highly risky operating environment. Traditional safety management relies on manual inspections and basic sensors, which are insufficient in several ways: manual inspections cannot cover all times of the day, and the risk of accidents increases significantly during nighttime or unattended periods; they also fail to identify behavioral hazards, such as not wearing protective goggles or improper use of protective equipment. In recent years, laboratory safety incidents at universities have become increasingly frequent, including fires

caused by reagent leaks and injuries due to lack of protection. There is an urgent need for an intelligent, real-time proactive safety management system. To address this, the "Shadow Following" project aims to use computer vision technology, combining dynamic detection with static analysis, to build a comprehensive safety monitoring system that covers both environmental risks and personnel behavior, providing a closed-loop solution from early warning to incident response.

The core functions and technical implementation of the model are as follows: the project uses the YOLOv8 object detection model, combined with a three-frame difference dynamic detection algorithm, to achieve precise monitoring and energy efficiency optimization of laboratory environments. The YOLOv8 model has been optimized to efficiently identify static risk targets, such as protective goggles and lab coats, fires and smoke, integrating data from infrared cameras and gas sensors to reduce misjudgments. The system employs a three-frame difference method to achieve motion-based activation. By analyzing the pixel changes in three consecutive frames of video, the YOLOv8 model is activated only when movement (such as people running or objects tipping over) is detected in the scene, while it remains dormant in static scenes. This strategy significantly reduces the computational load on edge devices, lowering power consumption by more than 50% during unattended periods. For instance, when no one is in the lab, the system maintains minimal baseline monitoring. Upon detecting a person entering, it immediately switches to full-function detection, balancing real-time performance with energy efficiency. The project has developed an intelligent, low-power safety system for the Beijing Institute of Technology laboratory. The core technology involves a combination of static and dynamic risk identification (covering protective wear, fire warnings, and behavioral norms) and efficient deployment of edge computing, which meets the detection requirements of complex scenarios while adapting to the resource constraints of university laboratories.

Conclusions

Artificial intelligence, as a strategic technology driving the new wave of technological and industrial revolution, has become a key indicator of a nation's comprehensive strength. Universities, as the core of the national innovation system and a hub for cultivating high-level talent, bear the significant responsibility of serving national strategic needs and securing a leading position in technological competition. In the context of intensified global AI competition and the urgent need for breakthroughs in core technologies, Chinese universities must undergo systematic and forward-looking reforms in areas such as scientific and technological planning, disciplinary development, research organization, technology transfer, and talent cultivation, to create a new engine for the national AI strategy through unconventional measures.

(i) Strategic Guidance: Anchoring National Needs and Consolidating Foundations of Basic Research

Faced with the urgent need for a global competitive landscape and national strategic transformation driven by the rapid development of artificial intelligence technology, Chinese universities, as the core engine of innovation and the center for elite talent cultivation, must adopt forward-looking perspectives and extraordinary measures to comprehensively reshape their development positioning and strategic orientation. They should deeply understand the national strategic intentions in AI and address key bottlenecks in technologies, making the fulfillment of major national priorities the central aim of

discipline development, scientific research, and talent cultivation. In this process, high-level research universities must take on significant responsibilities, fully leveraging their role as the main force in national fundamental research and the source of major scientific and technological breakthroughs. This requires universities to significantly enhance the strategic status and organizational capacity for fundamental research, ensuring long-term, stable investment in AI foundational theories, frontier explorations, and disruptive innovations through optimized resource allocation, providing fertile ground and inexhaustible momentum for the China's original innovation in the field of artificial intelligence.

(ii) System Restructuring: Breaking Disciplinary Barriers and Stimulating Original Innovation

Universities urgently need to reconstruct the disciplinary ecosystem with the courage of reform and innovation. They must not only "strengthen the foundation" but also "break down barriers and pursue integrated, unconventional development" On one hand, they must firmly strengthen the foundational disciplines that support AI development, such as mathematics, computational science, and brain science, to ensure a solid theoretical foundation. On the other hand, they should establish a highly agile mechanism for dynamic adjustments in disciplines, breaking free from conventional constraints, and making unconventional strategic layouts in cutting-edge areas critical to national interests (such as AI security, trustworthy AI, embodied intelligence, and AI ethics governance), quickly respond to technological iterations and changes in industrial demands. More crucially, they need to break through traditional disciplinary barriers by building substantial interdisciplinary platforms or virtual collaboration networks (such as "AI + life sciences" , "AI + materials" and "AI + social sciences"), removing institutional and systemic obstacles to create fertile ground for cross-disciplinary innovation. On this basis, universities should vigorously implement the 'Breakthrough Initiative for Basic and Interdisciplinary Disciplines,' using major national projects and the formation of interdisciplinary teams as key drivers. They should systematically identify forward-looking, challenging scientific and technological issues with from national strategic needs (such as national defense security, economic development, and public welfare), organize large-scale cross-university and cross-field collaborative teams to tackle them in an organized, mission-driven manner, and strive to continuously produce original and disruptive scientific and technological innovations. At the same time, efforts should be made to establish a spiral upward mechanism where scientific and technological innovation and talent cultivation support each other. This mechanism aims to promptly convert cutting-edge research outcomes into high-quality teaching resources, and to deeply cultivate students' practical innovation capabilities through high-level research projects. Furthermore, the improvement in talent development should revitalize scientific and technological research, forming a core driving force for the high-quality development of disciplines.

(iii) Innovative Practice: Connecting the Transformation Chain and Forging a Highland for Top Talents

To bridge the "last mile" of technology achievement transformation and convert the intellectual advantages of universities into practical productivity is a critical component of serving national strategies. Universities must address and resolve key bottlenecks in AI technology transfer, such as unclear intellectual property rights, insufficient pilot-scale verification, and weak market connection. This can be achieved by establishing specialized technology transfer institutions, reforming the distribution mechanisms for research outcomes, and introducing venture capital and incubator support.

The core is to build a high-level, deeply-integrated university-enterprise collaborative innovation platform (such as joint laboratories and innovation centers) built on shared interests, and joint risk-bearing. This ensures that the real needs of enterprises are effectively integrated into the research and talent development processes within universities, achieving precise matching from demand to the R&D. Moreover, innovative cooperation models should be explored, such as co-building open-source platforms, jointly setting up frontier exploration funds, and participating in the formulation of industry standards, which go beyond traditional project-based collaborations. This will create an innovation ecosystem that deeply integrates industry, academia, research, and application, with the government playing a key role in guiding and coordinating. In terms of talent cultivation, universities should establish an integrated education system spanning undergraduate, master's, and doctoral level that emphasizes foundational training, interdisciplinary studies, and frontier-oriented development This system should strengthen project-based learning and challenge-driven inquiry, implementing dynamic selection and personalized training.

Particular emphasis should be placed on equipping students with practical innovation capabilities to solve complex engineering and scientific problems through involving them in major national research projects and high-end research platforms, while embedding a sense of national mission and civic responsibility. At the same time, it is essential to optimize evaluation and incentive mechanisms, breaking away from the narrow focus on publications. This involves establishing evaluation criteria that highlight innovation potential and contributions to solving major issues, along with corresponding scholarship and research resource allocation policies. These measures are designed to fully unleash the innovative potential of outstanding talents. Only through such measures can universities truly cultivate a high ground of top-notch innovative talents that support the long-term development of the national AI strategy.

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