

AI IN EDUCATION AND RESEARCH: OPPORTUNITIES IN COLLABORATION BETWEEN CHINA AND CUBA

IA EN EDUCACIÓN E INVESTIGACIÓN: OPORTUNIDADES EN LA COLABORACIÓN ENTRE CHINA Y CUBA

Mercedes Delgado Fernández ^{1*}  <https://orcid.org/0000-0003-2556-1712>

¹ Escuela Superior de Cuadros del Estado y del Gobierno (ESCEG), La Habana, Cuba

✉ mercedes@esceg.cu

* Corresponding author: mercedes@esceg.cu

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Cuba and China are countries connected by strong historical ties of solidarity and friendship, which have been demonstrated during the 65 years of diplomatic relations, celebrated on September 28, 2025. In higher education, collaboration has been very fruitful with a wide variety of agreements signed between universities for educational, scientific, and cultural exchange.

This editorial from Volume 9 of the Cuban Journal of Public and Business Administration, published by the Higher School of State and Government Cadres, presents a collection of 11 articles by 48 professors from the Beijing Institute of Technology (BIT) in honor of its 85th anniversary, which will be celebrated in September 2025. Both institutions are universities that signed a collaboration agreement in 2024 and in just one year have developed several actions such as visits, academic exchanges, scientific seminars, publications, and are planning the design of study programs for the training of managers and teachers in the fields of public and business administration, governance, digital transformation, artificial intelligence, and teaching and learning methods.

This collection of articles focuses on the central theme of Artificial Intelligence (AI) with an emphasis on its use in the educational field, highlighting the benefits, risks, and most commonly used technologies. AI has significantly evolved, impacting various areas of society in recent years, where tasks that normally require human cognitive abilities are performed. It uses different technologies such as machine learning, deep learning, robotics, Big Data, and the Internet of Things (IoT), natural language processing, image processing, object detection, virtual reality, augmented reality, voice recognition, and computer vision.¹⁻³ Artificial Intelligence (AI) combines machine learning and deep learning techniques with models trained on large data sets to make intelligent decisions autonomously, acting like a human intellect or replicating human intelligence.¹

AI allows for the immediate processing and analysis of large amounts and diverse information to automate various processes, including those related to the public policy cycle. However, there are disadvantages such as exclusion, bias in estimates, lack of privacy, and limited transparency,^{2,4,5} which determine the need to minimize these risks⁶ to take advantage of the benefits its technologies provide. The challenges posed by AI have made it necessary for some institutions, such as universities, to establish strategies and adopt measures to harness its potential while safeguarding academic integrity and ethical values, with a critical and adaptive approach.⁷

Other suggestions for using AI relate to the quality of data sources and the ability to design and implement solutions with data from local contexts; addressing systematic biases; adopting policies and standards to ensure data privacy, security, ethics, accountability, and confidentiality; and confidence in the use and generalization of models.⁸ Also highlighted is the alert regarding the inappropriate use of knowledge in product innovation, which encourages the generation of research around the effect of artificial intelligence and robotization.⁹ Artificial intelligence systems process information and are made up of databases, statistical models and algorithms to perform classification and prediction procedures.¹⁰

The first article, "Governing ai's sustainability: risks, current responses, and pathways for improved governance," proposes the concept of a Green AI Index as an adaptable framework of traceable and comparable indicators that supports the identification, assessment, and management of multidimensional AI sustainability risks for improved governance performance. By mapping these challenges, evaluating existing responses, and outlining concrete paths forward, the paper seeks to inform policymaking and promote the development of more effective, consistent, and inclusive strategies for sustainable AI governance.

The second article, "Exploration and practice of knowledge services in university libraries driven by artificial intelligence," systematically reviews the evolution of knowledge services from paper-based resource services to intelligent services through four key dimensions: technological empowerment, demand-driven approaches, scenario expansion, and ecosystem reconstruction. A multi-level AI-centric knowledge innovation services matrix is proposed, encompassing technical, demand-side, scenario, and service layers. This framework is used at the BIT Library as an empirical case study, highlighting the importance of adopting innovative service strategies in libraries that leverage technological advances and optimize processes.¹¹

The third article, "AI-enabled disciplinary construction and assessment: dilemmas and pathways," proposes a strategic path forward by deepening conceptual understanding and breaking down cognitive barriers to more effectively integrate AI into the decision-making process, building collaborative, open, and value-based assessment platforms to foster multi-stakeholder engagement, advancing human-AI collaboration, and driving adaptive transformation in assessment organizations through technological innovation, thereby creating a governance ecosystem characterized by human-machine complementarity and flexible responsiveness.

The fourth article, "Constructing and innovating research-teaching communities driven by interdisciplinarity," discusses the creation of the Advanced Interdisciplinary Research and Education Center (AIREC) at the BIT. This initiative can contribute to fostering a virtuous cycle between education,

science and technology, talent development, and the training of doctoral students with broad interdisciplinary skills. It will also advance the high-quality development of "Double First Class" disciplines.

The fifth article, "Reinventing classic courses: a paradigm reconstruction study of AI-empowered signal processing curriculum," proposes a restructuring of knowledge systems, innovation in experimental methods, and reform of assessment mechanisms, thereby creating a new teaching ecosystem that deeply integrates fundamental theories, smart technologies, and cutting-edge applications.

The sixth article, "Practice-oriented legal education system: innovation – exploration at BIT Law School based on "two-wing synergy and three-dimensional collaboration"," outlines several specific measures to make legal education practice-oriented. These include the need to deepen ideological and political education in practical law courses; boosting the digitalization of practical training; promoting internationalization through the creation of collaborative innovation platforms; and improving practical assessment in professional degree programs.

The seventh article, "One core with multiple competences, catalyzing intelligence fusion toward a world-class AI School with bit distinction," examines the establishment of the Beijing Institute of Technology (BIT) AI School as a research object and explores innovative avenues for the intelligent transformation of Chinese higher education in the AI era.

The eighth article "Reconstructing Graduate Supervisor Competencies from the Perspective of Artificial Intelligence" explores in depth the evolution and ways to improve the professional competencies of graduate supervisors in the context of AI, analyzing the impact of generative AI on the roles of teachers and students, as well as on teaching and research in graduate education.

The ninth article, "Dynamic Knowledge Graph-Driven Competency Evolution Framework: An Intelligent Integrated Training Approach to Educational Bridge Fragmentation," explores the construction of a dynamic, three-stage, goal-oriented integrated undergraduate and graduate education system based on knowledge graphs, proposing a four-dimensional collaborative model encompassing curriculum, practice, capacity, and management.

The tenth article, "Construction and application of a multi-source data-driven intelligent model for industry-research demand analysis in smart education," explores the construction of a dynamic, three-stage, integrated undergraduate and graduate education system based on knowledge graphs. This paper proposes a progressive, three-phase framework for building a multi-source data-driven intelligent analysis model for industry and research demand, integrating tripartite data from industry, academia, and policy.

Finally, the eleventh article, "Research on the integration of education, technology and talent development in artificial intelligence under the perspective of new quality productive forces," exposes the interrelationship between education, technology, and talent within the framework of AI. It presents the integration of BIT's ChatBIT AI-based education system and analyzes how AI is driving the educational revolution.

In the areas described in this collection of 11 BIT articles, AI offers diverse opportunities for collaboration between universities in Cuba and China by establishing alliances with the different actors involved in research, development, and innovation. (R&D&I) promoting open, ethical and inclusive science and innovation. AI emulates human cognitive functions, such as problem-solving and decision-making, performing complex activities, and growing the market with new applications, products, and services,¹² improving the efficiency and effectiveness of different sectors, fostering the development of new business models,¹² all of which also requires standardization.¹⁴

Artificial neural networks are used in the development of expert systems and machine learning,⁴ allowing machines to learn from data without explicit programming, and are used in decision-making and problem-solving.¹⁵ Machine learning (ML) enables high-performance data analysis to extract useful insights, categorize, predict, and make evidence-based decisions in novel ways, which will promote the growth of new applications and drive the sustainable rise of AI.¹⁶ Generative AI is another area of research as it is extremely powerful and requires large model languages.¹⁷

In the educational field, the need for AI literacy for teacher training that encompasses both technical skills and ethical understanding is highlighted.^{18,19} Generative AI in education can be approached from four perspectives: personalized education, intelligent teaching, collaborative education, and virtual teaching.²⁰ The results reveal considerable research diversity in Artificial Intelligence in Education (AIED), centering around two sustained themes: intelligent tutoring systems and massively open online courses; the highly connected keywords relevant to analytical techniques within this field include natural language processing, educational data mining, learning analytics, and machine learning.²¹

The development trend of AIED has been developing to empower learner agency and personalization, enable learners to reflect on learning and inform AI systems to adapt accordingly, and lead to an iterative development of the learner-centered, data-driven, personalized learning.²² Neural networks, deep learning, eye tracking, and personalized learning are trending keywords in this field. Los algoritmos del Machine Learning (ML), la Inteligencia Artificial (IA) y los Métodos Adaptativos tienen gran utilidad en los nuevos diseños pedagógicos²³ y la integración de plataformas e-Learning con IA se denomina Aprendizaje Adaptativo Inteligente (AAI) que adaptan dinámica y automáticamente las actividades de aprendizaje a los requerimientos y necesidades específicos de cada estudiante.^{24,25}

All these areas also constitute research fields in collaboration between universities, promoting greater effectiveness and efficiency.²⁶ A Cuba-China community with a shared future also presupposes the joint development of models that utilize practice-oriented AI trends and tools, considering their contexts, strategies, and levels of development, ensuring the satisfaction of current and future demands in the construction of socialism in both countries.

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Conflict of interests:

The authors declare that they have no conflicts of interest.