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BOOK REVIEW

Shaping the Future of Digital Intelligence Education: A Book Review of *The White Paper on Digital Intelligence Education of Wuhan University*

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1 Introduction

The white paper on digital intelligence education of Wuhan University (hereafter referred to as the white paper) represents a groundbreaking and a systematic proposal for cultivating digital intelligence talents in higher education (Zhang, 2024). It offers invaluable practical cases and profound insights for domestic and overseas universities. Edited by Professor Pingwen Zhang, the president of Wuhan University and an academician of the Chinese Academy of Sciences, the white paper showcases Wuhan University's pioneering achievements and far-reaching impacts in advancing digital intelligence education.

2 Responding to the Challenges in the Digital Intelligence Era

With the rapid advancement of technology and the advent of the digital era, digitalization and intelligentization have emerged as pivotal forces in reorganizing global resources, reshaping the world economic structure, and redefining international competition. Driving digital intelligence transformation and innovation has become a pressing issue for higher education institutions worldwide. These institutions are critical intersections of technology as the primary productive force, talent as the primary resource, and innovation as the primary driving force. Wuhan University, adopting a global perspective and shouldering its mission in the digital intelligence era, remains steadfast in its core functions of talent cultivation and scientific research. Wuhan University actively embraces the digital intelligence era, responding strategically to the profound changes and challenges it brings.

Leveraging Wuhan University's distinctive disciplinary strengths and forward-looking visions, the white paper illuminates the future trajectory of digital intelligence education. Driving the transformation of higher education with digital intelligence not only aligns with national strategies but also offers universities a historic opportunity in the new era. Wuhan University is persistently deepening its exploratory reforms in digital intelligence education, and benefiting each student from data science knowledge and skill development. Anchored in the core principles, knowledge systems, supporting structures, evaluation standards, and talent cultivation pathways of digital intelligence education, the white paper outlines a talent development model tailored to the university's characteristics and proposes actionable solutions for advancing digital intelligence education.

3 Developing a Digital Intelligence Talent Development System

The white paper systematically outlines Wuhan University's initiatives of "top-level design, overall planning, classified training, and steady progress" in the field of digital intelligence education. It serves as a guiding framework for nurturing top-tier digital intelligence talents and accelerating the university's digital and intelligent transformation. As highlighted in the white paper, Wuhan University's distinctive integrated digital intelligence talent training system adheres to the overarching goals of providing comprehensive digital intelligence education and implementing differentiated and specialized talent cultivation. This training system is underpinned by an

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approach combining five key elements, namely, cultivation of digital thinking as foundation, development of digital literacy as extension, refinement of intelligence courses as key, classification of digital intelligence talents as support, and establishmenet of digital intelligence platform as guarantee. The system is propelled by a "five-digitals-in-one" concept, ensuring the comprehensive and effective cultivation of digital intelligence talents across the university.

The overarching goals reflect Wuhan University's insights into nurturing digital intelligence talents. The term "comprehensive" underscores the broad foundational approach to cultivate innovative digital intelligence talents, while the terms "differentiated and specialized" highlight the specialized features and practical requirements of talent training. These elements complement each other, reflecting Wuhan University's approach of cultivating a broad knowledge base with a solid foundation and integrating general education with specialized training.

This "five-digitals-in-one" training concept is the core philosophy of the integrated system for developing digital intelligence talents. It aims at fostering digital thinking as the foundation, enhancing digital literacy as a critical component, refining digital intelligence courses as the key focus, categorizing digital intelligence talents as the basis, and establishing a digital intelligence platform as the support. The essential concepts promote a seamless integration of digital intelligence talent development across the university. In other words, it is imperative to establish courses that promote digital literacy and critical thinking, to incorporate application scenarios and practical resources within a unified platform, and to offer specialized training that accommodates the requirements of different disciplines.

The five-dimension driven program is built around a "classified + gradient" modular structure, a "basic + scenario-based" differentiated teaching strategy, and an "integrated + innovative" development approach. Wuhan University has unified 18 core data science courses, including 3 undergraduate general courses, 6 undergraduate foundational courses and master supplementary courses, 7 specialized elective courses for undergraduates and compulsory courses for master students, and 2 compulsory doctoral courses. Such systematically structured curriculum provides a solid foundation for flexible and categorized training. Most courses integrate foundational knowledge with scenario-based application training tailored to specific needs. The white paper systematically outlines Wuhan University's talent training system for digital intelligence at the bachelor's, postgraduate's, and doctoral levels, presenting a comprehensive view of the implementating strategies and practical outcomes of the digital intelligence curriculum. The five-dimension driven training program fulfills the talent development needs across diverse fields and academic levels, driving deeper interdisciplinary integration of data science and systematically advancing the digital transformation of various degree programs using university-wide resources.

The training program also emphasizes the digital intelligence education platform as a key pillar for talent development. Wuhan University has introduced the innovative strategies and practical approaches for creating a university-level experimental and innovative teaching platform focused on developing digital intelligence talents. Following the principles of "co-construction and sharing, interconnection, cross-integration, and open operation", this platform features a platform-based "standard system" and a "one-stop portal", integrating three core resources including data, tools, and computing power. These resources support talent training, scientific research, innovation and entrepreneurship, and social services. The platform is designed to train students in the use of real data, models, algorithms, computing power, and scenarios, thereby enhancing their comprehensive abilities to solve real-world problems. The approach aims at cultivating a community for the development of digital intelligence talent, spanning cognition, practice, innovation, and entrepreneurship.

The implementation of the five-dimension driven training program is a systemic endeavor that requires the full integration of Wuhan University's high-quality resources. The white paper introduces a "five-digitals-in-one" strategy to guide the development of digital intelligence talents. This strategy includes full coverage of students, university-wide access to courses and resources, integration of digital tools in teaching, and interdisciplinary integration. Specifically, full student coverage entails the comprehensive updating of both undergraduate and postgraduate training programs. Individualized training calls for the restructuring of teaching contents and methods. The integrating and sharing of the university-wide resource require a fully developed digital intelligence platform that consolidates both internal resources and industry and research resources. The integration of digital tools into teaching necessitates advancements in digital textbooks, online teaching, simulated training, and intelligent assessment. Moreover, emerging interdisciplinary fields should be established to meet the university's requirements for developing digital intelligence talents.

The white paper represents an innovative initiative by Wuhan University to establish models and pathways for developing digital intelligence talents. Its release marks the beginning of a new phase in the systematic and standardized exploration and implementation of digital intelligence education in the university.

4 Exploring the Principles of Digital Intelligence Education

The white paper innovatively defines digital intelligence education as "the composite talent education model with Big Data and AI technology as the main carrier, and with the cultivation of students' digital thinking, digital literacy, intelligent computing skills and ability to solve problems digitally in the era of digital intelligence as its goal." This definition profoundly reveals the essential characteristics of digital intelligence education and clearly outlines its core components. The "data" in the definition serves as the bedrock of the digital literacy, forming a crucial basis for building systems of knowledge and skills in digital intelligence. Digital thinking, AI skills, and digital capabilities form the framework of digital literacy, which is the central goal of talent development. Interdisciplinary studies, as important vehicles for education, reflect how digital intelligence education transcends traditional disciplinary boundaries, promoting cross-disciplinary integration and innovation driven by Big Data and AI technologies. The principles of digital intelligence education provide new theoretical perspectives for universities exploring educational transformation and innovative talent development models in the digital intelligence era.

The white paper systematically organizes the knowledge framework for developing digital intelligence talents and effectively addresses key issues concerning digital literacy and educational contents. It emphasizes that the knowledge system is closely aligned with data science, with a focus on application-oriented training that is deeply rooted in disciplinary contexts. The white paper also outlines core courses and data resources across eight key areas, including Big Data on natural science, geospatial Big Data, Big Data on health and medical care, Big Data on industrial production, Big Data on finance and business, Big Data on urban and rural governance, Big Data on legal affairs and public opinion, and Big Data on humanities and social science. These eight areas are classified according to data-augmented and data-application disciplines, and organize the digital intelligence knowledge system into four categories including general education, empowerment, application, and specialization. This represents an innovative interpretation of the knowledge framework for digital intelligence talents across wide fields. It provides a clear guidance for talent development initiatives and offers a significant theoretical framework for exploring future-oriented pathways and models for nurturing top-tier talents.

The five-dimension driven program and "five-digitals-in-one" strategy proposed by the white paper effectively address the key issues in digital intelligence talent training. The structured curriculum bridges the gap between diverse disciplinary training needs and a unified knowledge base. By incorporating scenario-based courses and integrating a digital intelligence platform, the approach fosters the development of both digital intelligence education and digital intelligence talents. The digital intelligence training connects industry, academia, and research, effectively linking theoretical learning with practical application. The "standard system" and "one-stop portal" of the platform provides innovative solutions to centralize the university's previously dispersed and fragmented training resources. This forward-looking and practical training framework for digital intelligence talents sets a benchmark for other universities to follow.

Furthermore, the white paper demonstratively outlines Wuhan University's systematic process in top-level design and overall planning for digital intelligence education. It highlights the university's deep insights into the practical foundations and real-world challenges in cultivating talents for the digital intelligence era, as well as its innovative responses. The white paper summarizes the university's traditional strengths and distinctive features in this field through three key aspects, including its educational philosophy, advantages in interdisciplinary collaboration, and its transformational practices and lessons in digital intelligence education. It, specifically, emphasizes deepening the integration of digital intelligence with interdisciplinary development, continuously refining the general education system, actively advancing the in-depth integration of information technology into the end-to-end process of talent development and educational management and support services, and effectively leveraging industry–academia–research resources to build a robust digital intelligence education framework. These efforts provide strong supports for formulating a university-wide integrated digital intelligence talent cultivation plan. With detailed data and case studies, the white paper comprehensively reviews the university's foundational resources for digital intelligence talent cultivation, covering areas such as training objectives, academic programs, curriculum systems, teaching materials, faculty development, and experimental teaching resources. Based on this review, it identifies key issues for exploration and resolution, including developing a university-wide digital intelligence curriculum framework, establishing an effective mechanism for resource sharing, and improving the quality of elite talent development in the digital intelligence era. Notably, scientific investigation and deep reflection form the cornerstone of Wuhan University's digital intelligence talent development framework. These

practices also provide valuable insights and baseline data for other universities advancing their transformation toward digital intelligence.

5 Shaping the Future of Digital Intelligence Education

As global higher education undergoes a critical phase of digital transformation, universities are actively exploring practical, regional-specific, local, and institutional solutions to cultivate talents for the digital intelligence era. The white paper not only marks a significant milestone in Wuhan University's progress in digital intelligence education, but also provides a roadmap for the future development of this field. Building on these initiatives, the Digital Intelligence International Development Education Alliance (DI-IDEA) released *White paper on digital intelligence education development* to a global audience at the Beijing Forum in November 2024 (DI-IDEA Secretariat, 2024). Through in-depth case studies, the review highlights the achievements of leading universities worldwide in digital intelligence education, including advancements in curricula, platforms, teaching assistance, evaluation methodologies, and collaborative practices (DI-IDEA Secretariat, 2024). The goal is to offer the higher education more open and diverse perspectives and actionable solutions to advance digital intelligence education.

As a further development, the white paper expands on the concepts and components of the digital intelligence education system. It provides a comprehensive theoretical framework for the training of innovative talents in digital intelligence, focusing on five key systems, namely disciplinary system, curriculum system, textbook system, support system, and evaluation system. Moreover, it proposes four action plans to promote the global development of digital intelligence education, including enhancing leadership, establishing standards, developing a framework, and sharing a platform.

The aim of enhancing leadership in digital intelligence education is to build an inclusive and highly efficient international network for educational development. University leaders equipped with strategic thinking skills, technological insights, and the ability to innovate in the digital intelligence era are driving forces to push innovation and reforms in their institutions. These leaders ensure that all students and faculties can fully leverage digital intelligence technologies to achieve optimal and personalized educational outcomes.

The goal of establishing standards is to provide institutions with a normative guide to develop digital intelligence training programs. These standards offer a comprehensive framework of ethical principles, usage boundaries, and safeguards, promoting the responsible and ethical use of digital intelligence technologies and supporting the sustainable development of digital intelligence education.

The purpose of developing a framework for digital intelligence education is to provide universities with forward-looking guidance. This framework provides a solid conceptual foundation, actionable strategies, and specific assessment methods to foster innovation, ethical responsibility, and social engagement in digital intelligence education.

A shared digital intelligence education platform is intended to be an open resource system that fosters collaborative creation and exchange of educational and research outcomes. This platform collects and shares case studies and teaching experience from global educators in digital intelligence education. It guides teachers in leveraging emerging digital and intelligent technologies, including generative AI, to innovate their teaching methods.

Both the white paper of Wuhan University and DI-IDEA explore the development patterns of digital intelligence education in higher education institutions, facilitating the open sharing of research findings and practical achievements, while providing a forward-looking analysis of global trends in digital intelligence education. These two white papers are expected to raise awareness, deepen understanding, and gain support for digital intelligence education. They aim at attracting more universities, experts, and scholars to this field, ensuring a continuous supply of exceptional digital intelligence talents that will contribute to the sustainable development and common prosperity of the society. Notably, the white paper published by Wuhan University advances the development of digital intelligence education, marking the dawn of a new era defined by efficient, inclusive, and innovative teaching practices.

Conflict of Interest The authors declare that they have no conflict of interest.

Data Availability Statements The authors confirm that all data generated or analysed during this study are included in this published article.

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