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Empowered by Digital Intelligence: Constructing a New Digital Education Ecosystem in Higher Vocational Education

Taking Nanchong Vocational and Technical College as an Example

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ABSTRACT
The deep integration of digital technology and artificial intelligence is comprehensively reshaping the entire elements, processes, and scenarios of higher vocational education. Based on the integrated construction needs of "teaching - management - service" in vocational colleges, taking the typical practice of Nanchong Vocational and Technical College as an example, this paper proposes the construction framework of "one platform, three projects, and three benchmarks". This framework constructs a smart campus system with the core content of "three plans, four spaces, and two platforms" by driving the implementation of three major projects: teaching innovation, internal governance, and service education. The research aims to explore the construction of a sustainable digital education new ecosystem, providing theoretical references and practical paths for the digital transformation of higher vocational education.

Keywords: *Digital intelligence empowerment, Digital transformation, Vocational education, New ecosystem of education, Data governance.*

1. INTRODUCTION

In the report to the 20th National Congress of the Communist Party of China, General Secretary Xi Jinping, taking into account the overall development of the Party and the country, clearly put forward the strategic requirement to “advance the digital transformation of education and build a learning society and a learning nation for lifelong learning for all”. This has charted the course for educational reform and innovation in the new era and provided fundamental guidance for building China into an education powerhouse. With the successive release of policy documents such as the “Outline of the Plan for Building China into an Education Power (2024–2035)” and the “Guidelines for Artificial Intelligence Application in Vocational Colleges”, the digital transformation of higher vocational education has entered a critical phase of transition from “technology empowerment” to “ecosystem reconstruction” [1]. The "Digital Empowerment of Teacher Development Action" issued by the Ministry of Education in 2025 further clarifies that through 3-5 years of systematic promotion, teachers' digital literacy will be comprehensively improved, and effective implementation paths for human-machine collaborative teaching will be actively explored and formed.

The new era nurtures new education, and new technologies build new ecosystems. Nanchong Vocational and Technical College actively responds

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to the national strategic deployment, strictly follows the policy requirements of the "National Education Digitalization Strategy Action", "National Vocational Education Reform Implementation Plan" and "Three Year Action Plan for" Data Elements X "(2024-2026)", closely follows the school's development strategic goals, innovatively proposes the "one platform, three projects, three benchmarks" construction framework, and is committed to actively cultivating and building a dynamic new ecosystem of campus digital education. Currently, digital education has entered a new stage of deep integration between policy driven and practical innovation, characterized by the extension of technology penetration from the tool level to the ecological level.[2]

2. THEORETICAL FRAMEWORK: "ONE PLATFORM, THREE PROJECTS, THREE BENCHMARKS"

2.1 Overall Architecture

“One platform” refers to the digital base of a smart campus that integrates innovation; "Three projects" include teaching innovation project, internal governance project, and service education project; "Three benchmarks" are the corresponding demonstration benchmarks for smart teaching, smart management, and smart services. This framework takes data governance as the core driving force, scenario requirements as the implementation mainline, and teacher-student development as the value orientation, achieving digitalization of educational elements, intelligent business processes, and scientific governance decisions. The digital transformation is fundamentally changing the core elements and operational logic of education, which requires the education system to transform from technological applications to ecological reconstruction.[3] The framework is shown in “Figure 1”.

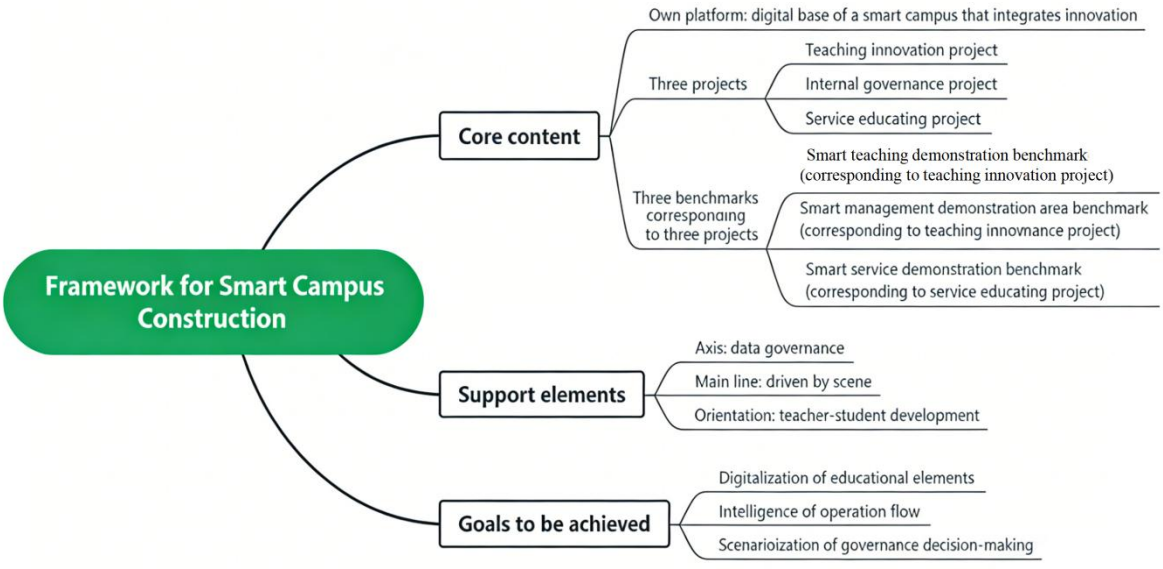

Figure 1 Schematic diagram of "one platform, three projects, three benchmarks” framework.

2.2 Mapping of Core Content

The authors refine the "three projects" into actionable and quantifiable implementation matrices, as shown in “Table 1”. Practice has shown that the construction of smart campuses needs to be based on the actual needs of universities, and achieve breakthrough development through a closed-loop logic of "problem orientation - path design - effectiveness evaluation".[4]

Table 1. Implementation matrix of "three projects"

Project Name	Sub-item		Key task
Teaching Innovation Project	Three plans	“Information technology+” professional leap plan	Adding 5 new digital direction majors
		Professional big data center construction plan	Building one professional big data center
		Teacher information literacy enhancement plan	Establishing a closed-loop mechanism of "training - evaluation - competition"
	Four spaces	Smart teaching space	Building 2 new smart classrooms and renovating 142 regular multimedia classrooms
		Teaching resource space	Building 30 high-quality online open courses, 30 high-quality blended courses, 30 new format textbooks, and 20 virtual simulation training projects
		Online education space	Setting up 6 online teacher lecture halls
		Online learning space	Utilization rate reaching 100%
	Two platforms	Virtual simulation training public platform	Constructing one multi-window remote interactive synchronous teaching system and one virtual simulation training public platform
		Industry-education integration information service platform	Using the school technology service network as a carrier to build a platform for the integration and transformation of industry and education
Internal Governance Project	School situation analysis and decision-making platform		Breaking down data barriers for 10 core business systems
	AI teacher-student development platform		Building teacher portraits and student portraits
	Intelligent security comprehensive management platform		Implementing comprehensive and unified display and management of school security elements
Service Educating Project	Integrating technology into ideological and political classrooms		Realizing precise intervention and safe controllability of mental health based on student portrait big data
	Internship and employment guidance system		Using big data technology to guide internship arrangements and employment guidance
	Online service hall		19 online service items, achieving "one-stop service" for scientific research

3. IMPLEMENTATION PATH OF “ONE PLATFORM, THREE PROJECTS, THREE BENCHMARKS”

This framework constructs a smart campus system with the core content of "three plans, four spaces, and two platforms" by driving the implementation strive to three major projects: teaching innovation, internal governance, service education.

3.1 Smart Campus Platform: A Digital Base Driven by Data Governance

3.1.1 Implementing Data Governance Projects and Systematically Promoting the Construction of Data Centers

To ensure the systematic and sustainable nature of digital transformation, a data governance framework of "standard platform application" is constructed with data governance as the starting point. The effective operation of the digital education ecosystem relies on a sound governance system, with its core being the release of data value through standard specifications and collaborative mechanisms.[5]

3.1.1.1 Gap Analysis and Standard Improvement

Based on the core indicators of "data resource system" and "data governance system" in the "Digital Campus Standards for Vocational Colleges", a gap analysis is conducted on the existing platform to clarify the weak links in data standards, metadata management, and data quality management.

3.1.1.2 Master Data and Middleware Construction

Based on existing data standards and school level data center platforms, the concept of master data management and data middleware is introduced. Through API gateways, ETL service buses, and event driven architectures, 100% integration of core business systems such as academic affairs, student engineering, scientific research, personnel, and finance is achieved, forming a global data asset directory.

3.1.1.3 Data Quality Closed-loop Control

Using the ISO/IEC 25012 data quality model, it can dynamically monitor data quality from dimensions such as accuracy, completeness, consistency, and timeliness, and implement closed-loop improvements to eliminate information silos.

3.1.1.4 Data Value Release

Relying on the school level data platform, it is necessary to implement the principle of "one data source, one source for multiple uses", and enhance the efficiency of data in providing accurate supply and decision support for business needs.

3.1.2 Implementing Capacity Expansion and Quality Enhancement Projects to Upgrade Smart Campus Infrastructure

3.1.2.1 Data Center Hardware Optimization

It is a must to adhere to national and industry technical standards to optimize the hardware support system, and upgrade server clusters and iteratively renew compute nodes, increasing core computing capacity from 266 cores to 512 cores to meet high-concurrency teaching and research computing demands.

3.1.2.2 Storage Resource Expansion

It is essential to expand physical memory capacity from 2TB to 4TB to enhance data processing efficiency, and expand physical storage capacity from 600TB to 1000TB to establish a high-capacity, high-throughput storage resource pool.

3.1.2.3 Resource Centralized Management

95% of core business applications or more should be migrated to the “on-premises private cloud” platform. Virtualization technology will enable pooled management of computing, storage, and network resources, achieving centralized storage, elastic scaling, and dynamic resource sharing. This enhances utilization rates while reducing operational costs.

3.1.2.4 Network Architecture Upgrade

The school should implement redundant architecture transformation of core network equipment (dual machine hot standby, link redundancy), eliminate single point of failure, and improve network availability to over 99.99%. The school should also complete the upgrading and transformation of campus network IPv6, fully support the IPv6 protocol, and build the next generation Internet basic environment.

3.1.3 Implementing Security Protection Projects and Building a Network Security Guarantee System

3.1.3.1 Institutional System Improvement

Based on the “Cybersecurity Law”, “Data Security Law”, etc., 12 core systems can be revised and improved, such as the “Campus Network Security Management Measures” and the “Detailed Rules for Data Classification and Grading Protection”, clarifying the responsibility for data lifecycle security and emergency response mechanisms.

3.1.3.2 Protection Team Building

The school should construct a composite team consisting of full-time personnel, security liaison officers, and third-party experts, establish a capability enhancement mechanism, conduct training exercises, and build a three in one security framework of "management norms, technical protection, and emergency response" to achieve the

transformation from "passive defense" to "active prevention and control".

3.1.3.3 Technical Protection Upgrade

The school should deploy a new generation of intelligent firewalls, distributed intrusion detection systems (IDS), and terminal security management platforms to achieve comprehensive protection of network boundaries, core nodes, and terminals, upgrade the data backup and recovery system (local + remote disaster recovery dual mode), increase the efficiency of critical data backup by 40%, and shorten the recovery time to within 1 hour.

Compliance Construction: According to GB/T 22239-2019, the school should complete the second level evaluation of key information systems such as official websites and academic systems, with a focus on verifying compliance in 10 dimensions including physical environment, network architecture, and data protection.

3.2 Teaching Innovation Project: Creating a Benchmark for Smart Teaching

Guided by "Internet + vocational education", there is a must to construct a systematic project of "three plans, four spaces and two platforms" to build a new form of teaching wisdom. In the era of digital intelligence, educational innovation needs to break through traditional disciplinary boundaries and achieve knowledge ecology reconstruction and teaching paradigm transformation through technological empowerment.

3.2.1 "Three Plans" to Help Improve Teaching

Information Technology + Professional Leap Plan: Targeting the "Digital China" strategy and industrial upgrading, this plan aims to digitize traditional majors through technologies such as data governance, intelligent analysis, trend prediction, and decision simulation. Based on key professional groups, it is to develop emerging digital majors that meet the needs of high-end manufacturing, smart farming, smart logistics, green construction, and other fields.

3.2.1.1 Professional Big Data Center Construction Plan

The plan is to support professional groups and industry colleges to build professional big data centers, and integrate real production data from cooperative enterprises such as smart farming and industrial robots, forming high-quality big data assets, empowering classroom teaching, internship training, data mining and technology development, and providing enterprise consulting and technical support services to society.

3.2.1.2 Teacher Information Literacy Enhancement Plan

This plan is to develop evaluation criteria for teacher information application levels, establish a comprehensive training system, and build a platform for showcasing teaching abilities and competitions to achieve “promoting teaching and learning through competitions” and enhance teachers' information literacy and teaching practice abilities.

3.2.2 "Four Spaces" Expanding Teaching Space

3.2.2.1 Smart Teaching Space

This space requires to build two new exploratory and interactive smart classrooms, and renovate 142 regular multimedia classrooms and public computer rooms. It is necessary to build a data-driven teaching decision-making, real-time evaluation feedback, multi-dimensional interaction, and intelligent resource push mechanism to enhance the digitalization, intelligence, and personalization level of teaching space.

3.2.2.2 Teaching Resource Space

Based on the school-based resource management platform, a high-quality teaching resource library for professional groups will be systematically constructed, and a "co-construction sharing" mechanism will be established. Diverse platform resources will be integrated to achieve cross platform interconnectivity. Continuously Updating the Digital Library, 30 high-quality online courses, 30 high-quality blended courses, 30 new format textbooks, and 20 virtual simulation training projects form reusable and promotable resource construction standards.

3.2.2.3 Online Education Space

With key professional clusters as the core, an integrated online training platform will be built, and six "online teacher lecture halls" will be established. Targeting the needs of regional industries, it is

necessary to accurately push resources and provide online teaching, technology training, and lectures for enterprises, industries, and vocational colleges, building a multi-level online education ecosystem that covers on campus teaching, enterprise empowerment, and lifelong learning.

3.2.2.4 Online Learning Space

Supported by the collaboration of online education space, teaching resource space, and personal information space, it is aimed to build a fully interconnected and interconnected online learning space (with a 100% coverage rate of teachers and students), serving the "three education" reform, promoting the transformation of teaching mode towards "learning centered", and facilitating ubiquitous, mobile, and personalized learning.

3.2.3 "Two Platforms" Service Teaching Development

3.2.3.1 Virtual Simulation Training Public Platform

There is a must to construct one multi window remote interactive synchronous teaching system and one virtual simulation training public platform. It is necessary to utilize AI+VR technology to achieve multidimensional integration of "visual + auditory + tactile", bring enterprise on-site and industry experts into the classroom, construct a virtual real integration teaching mode of "virtual factory, virtual master", and support practical training of 10 major groups and more than 20 core courses. There is also a must to support online synchronous teaching and practical training with overseas universities such as Myanmar, Nigeria, and Laos.

3.2.3.2 Industry-Education Integration Information Service Platform

Based on the school technology service network, it is essential to upgrade the technical architecture and functional modules, and build a digital hub for industry education integration that integrates resource integration, supply and demand docking, and collaborative innovation. The core functions include intelligent matching of production and education resources (big data analysis to adapt to demand and supply), collaborative innovation service hub (project docking, achievement transformation, joint research and development), and talent development support system (skills training, employment guidance, lifelong learning).

3.3 Internal Governance Project: Creating a Benchmark for Smart Management

3.3.1 Building a School Situation Analysis and Decision-making Platform

With data-driven decision-making as the core concept, the school should establish a unified data standard and integrated architecture, break down business system barriers, and build an analysis and decision-making platform covering the entire process of education. Digital inclusiveness, as the core value of educational governance, requires the use of technological means to achieve precision and scientificity in the governance process.[7]

3.3.2 Building a Teacher-student Development Platform Based on Artificial Intelligence Technology

Leveraging AI deep learning, natural language processing, data mining, and other technologies, the school should construct an intelligent teacher-student development service platform that connects universities, enterprises, and society. Through the "dual center" collaborative architecture, the school can achieve intelligent analysis of teacher-student development data, personalized service supply, and full scenario application implementation, empowering teacher-student growth and optimizing resource allocation.

3.3.3 Building an Intelligent Security Comprehensive Management Platform

Relying on the Internet of Things AI, the school needs to build a campus security system with "global perception, collaborative linkage, and intelligent warning" using big data technology. The school should integrate diverse security services, break the fragmented pattern, achieve comprehensive integration and intelligent management of security elements, and create a safe and orderly educational and teaching environment.

3.4 Implementing the Service Education Project and Creating a Benchmark for Smart Services

3.4.1 Technology Integration into Ideological and Political Classrooms

It is necessary to integrate big data AI, build a digital support system that covers the entire process of ideological and political education through technologies such as mobile internet. To create a new ecology of ideological and political education with "online and offline collaboration, in class and out of class linkage", it is also necessary to promote the digital, precise and personalized transformation of ideological and political work, enhance the sense of the times and effectiveness of education (such as implementing precise psychological health intervention based on student portraits).

3.4.2 Construction of Internship and Employment Guidance System

With big data technology as the core, the school can build a system that integrates data collection, analysis and mining, and precise services, integrate data from the entire internship and employment chain, establish analysis models and intelligent service mechanisms, promote the transformation of guidance work from experiential and extensive to data-driven and precise, and enhance the adaptability of talent supply and demand and the competitiveness of student employment.

3.4.3 Improving the Functions of the Online Service Hall

With the goal of building a convenient, efficient, and intelligent collaborative digital service system, there is a must to comprehensively promote functional upgrades and service optimization. The school should break down the limitations of service time and space and process barriers, realize the transformation of public service supply mode, and provide teachers and students with a high-quality and low-cost service experience of "one-stop service" (19 service items have been launched, and scientific research has achieved "one-stop service").

4. CONCLUSION

This study systematically promoted the construction of a new digital education ecosystem at Nanchong Vocational and Technical College by constructing and practicing the framework of "one platform, three projects, and three benchmarks":

- Strengthening the digital foundation: there is a must to optimize the smart campus platform, and implement data governance, expansion and quality improvement, and security protection projects, significantly improving data quality, system stability, and security capabilities.
- Driving teaching innovation: The "three plans, four spaces, and two platforms" system engineering has effectively promoted the transformation of teaching forms, enhanced the adaptability between majors and industries, improved teachers' information literacy, expanded teaching space, and strengthened practical teaching abilities.
- Enhancing governance efficiency: The internal governance project can achieve data-driven decision-making, precise services for teacher and student growth, and intelligent security management through school situation analysis and decision-making, AI teacher and student development, and intelligent security platform construction.
- Optimizing education services: The service education project deeply integrates technology into ideological and political classrooms, improves internship and employment guidance and online service functions, and promotes innovation in ideological and political education and overall improvement in service quality.

Looking ahead to the future, the digital transformation of higher vocational education still faces both challenges and opportunities. On the one hand, it is necessary to continuously deepen data governance, deeply explore the value of data, and optimize teaching and management processes; On the other hand, it is urgent to strengthen the construction of a digital talent training system, which not only enhances teachers' digital literacy to adapt to teaching innovation, but also cultivates students' professional abilities and innovative thinking for the digital age. International experience shows that the promotion of inclusive digital education requires a balance between technological innovation and humanistic care, and a focus on multi-party collaboration in governance strategies. The future development of digital education will present trends such as deepening technological integration, expanding ecological boundaries, and upgrading governance capabilities. Next, the school

will focus on exploring the direction of national vocational education intelligent brain college middle platform docking, AIGC empowering personalized learning, and vocational education big model construction, and contribute more valuable "Nanchong Plan" for the construction of a new ecology of digital education in higher vocational education.

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