

^{1,*}Yumei Li

Exploration of Strategies for Promoting the Digital Transformation of Education in Ethnic Minority Areas



Abstract: - Digital transformation is a major trend in educational development. Ethnic minority regions, considering their geographical characteristics, actively promote the digital transformation of education. However, this process still faces numerous challenges. In view of this, this article proposes the following strategies: promoting the digital transformation and intelligent upgrading of the education system through the construction of an educational dedicated network to support the high-quality development of education; addressing issues in the construction of the "Internet + Education" platform and implementing the Smart Education Platform Construction Project; advocating the "Platform + Education" service model, establishing a "1+6+N" education digital platform system, and accelerating the digital transformation of education across the region.

Keywords: Ethnic Minority Areas; Education Digital Transformation; Smart Education; Strategies; Platform

I. INTRODUCTION

Currently, with the maturity and popularity of various information technologies such as cloud computing, big data, the Internet of Things, and virtualization, digital technology has penetrated every aspect of Chinese society and economic development. The changing internal and external environment of education has become an important factor driving the process of digital transformation in education. Digital transformation in education occurs in the digital age, triggered by social development and the influence of digital technology. It involves changes in educational concepts, the development of educational skills, transformation of educational methods, restructuring of educational structures, and reconstruction of educational culture, aiming to achieve comprehensive, free, and personalized development of learners. Accelerating the promotion of digital transformation and intelligent upgrading of education, vigorously advancing the digitization of education resources, implementing the strategic actions of educational digitalization, has become an important strategic deployment for national education reform and development [1]. With the deepening development of digital technology, new requirements have been put forward for the development of education in ethnic minority areas. Therefore, the development of education in ethnic minority areas should be combined with their own geographical characteristics and fully recognize the inevitable trend of digital transformation. As ethnic minority areas have their own geographical and developmental characteristics, and due to the different levels of regional economic development, the development of education varies in different regions, which poses new challenges for promoting the digital transformation of education and also brings new opportunities.

II. THE IMPORTANCE OF EDUCATIONAL DIGITAL TRANSFORMATION

Educational digitization is an important part of Digital China, which can be reflected in the following five aspects: (1) National strategic deployment—Digital China, Network Strong Country. National policies mention the necessity to occupy the commanding heights of information development and build a strong network, Digital China, and a smart society to drive modernization with information technology. (2) Promoting educational digital transformation is in response to national strategy. [2] National development plans coordinate education, science and technology, and talent, proposing to "promote educational digitalization and build a learning society and a learning-oriented country for all people." (3) Educational informatization has become a strategic choice and concrete practice for educational reform. The development timeline and important events of educational informatization in China can be seen in Table 1. (4) Strategic Action for Educational Digitalization. At the National Education Work Conference in 2022, the Minister of Education proposed the implementation of strategic action for educational digitalization, which is an important reform measure for China's education cause, injecting new impetus into high-quality education development. It is necessary to firmly grasp the working concept of "methods over technology, organizational and institutional innovation over technological innovation,"

¹ Key Laboratory of Intelligent Connected Vehicles Application Technology, Guangxi Vocational Normal University, Nanning, Guangxi 530007, China

*Corresponding author: Yumei Li

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and promote construction and application in an integrated manner according to the working requirements and train of thought of "application supremacy, service priority, demonstration guidance, and secure operation."

Table 1: Timeline and Key Events of Educational Informatization Promotion in China

Timeline of Policy Promotion for Educational Informatization	Key Events in the Promotion of Educational Informatization
2011	The Ministry of Education issued the <i>Ten-Year Development Plan for Educational Informatization</i> , which had a revolutionary impact.
May 2015	International Conference on Educational Informatization held.
2018	The Ministry of Education introduced the <i>Action Plan 2.0 for Educational Informatization</i> , shifting from considering informatization as tools or environments to treating it as an endogenous variable for systemic transformation in education. The goal is to achieve "three fulls, two highs, and one great."
2020	A large-scale online education practice was launched nationwide, leading to unprecedented rapid development in online education. With the normalization of epidemic prevention and control, online teaching has become a new norm in education.
2021	National opinions on promoting "Internet + Education" were issued.
2022	The Ministry of Education implemented the strategy of educational digitalization. "Promoting educational digitalization" has become a consensus.

(5) Educational informatization is an important support for a high-quality education system. The Ministry of Education and five other departments issued the "Guiding Opinions on Promoting the Construction of New Types of Educational Infrastructure and Building a High-Quality Education Support System" (Jiaokexin [2021] No. 2), proposing that by 2025, a structurally optimized, intensive and efficient, safe and reliable new type of educational infrastructure system will be basically formed, achieving long-term and comprehensive development through iterative upgrades, updates, and continuous construction. Support is provided in the following six aspects: 1) In terms of information networks, it is necessary to upgrade campus networks with the construction of an educational dedicated network; 2) In terms of digital resources, it is necessary to rely on the public service system of digital educational resources to establish a large-scale resource service mechanism for education, providing massive high-quality resources and accurate resource services to teachers and students through a platform model; 3) In terms of innovative applications, it is necessary to rely on the "Internet + Education" platform to innovate teaching, evaluation, research, training, and management applications, promote the deep integration of information technology and education, 4) In terms of platform system, it is necessary to build an "Internet + Education" platform that is interconnected, fully equipped, and collaboratively serviced; 5) In terms of smart campuses, it is necessary to construct digital campuses and smart campuses; 6) In terms of credible security, the goal is to achieve green internet access and trusted application [3-5]. Guangxi, as an underdeveloped area in education, according to the national policy of promoting the digital transformation of education, has implemented a development plan for "Internet + Education." The construction goal is to accelerate the transformation of education to digitalization, networking, and intelligence by 2025, make significant progress in the construction of new educational infrastructure, comprehensively promote the construction and application of "cloud, network, end, and security," and basically achieve the "332" development goal. "332" refers to three "ones," three "biggs," and two "comprehensives." The three "ones" refer to one cloud, one network, and one platform, providing intensive and efficient cloud-based service capabilities through educational cloud, constructing a green and secure educational network environment through educational network, and comprehensively carrying various levels and types of educational resources, applications, and services through the "Internet + Education" platform. The three "biggs" refer to big data, big resources, and big applications, comprehensively supporting the educational and teaching reform. The two "comprehensives" mean comprehensive popularization and comprehensive improvement, aiming to achieve the comprehensive popularization of digital campuses and the comprehensive improvement of teachers' and students' information application capabilities and information literacy.

III. STRATEGIES FOR ADVANCING EDUCATIONAL DIGITAL TRANSFORMATION

A. Construction of Educational Dedicated Network

1) *Implementation of the educational network construction project:* Constructing a comprehensive educational network throughout the region. The educational network consists of the educational backbone network, municipal and county-level educational metropolitan area networks, and school campus networks. It is interconnected with Guangxi's electronic government extranet, achieving multi-gigabit connectivity to counties, gigabit access to schools, and hundred-megabit connectivity to classrooms. The network is managed uniformly for "network access, network address, domain name configuration, user authentication," supporting IPv6 deployment and application at scale. This specialized network service provides rapid, stable, green, and secure network services for the entire educational system, supporting various levels of educational informationization services and enhancing the efficiency of educational management services. It promotes the digital transformation and intelligent upgrading of the education system, supporting high-quality education development. By the end of 2023, the comprehensive construction of the entire regional educational network as shown in Figure 1 below:

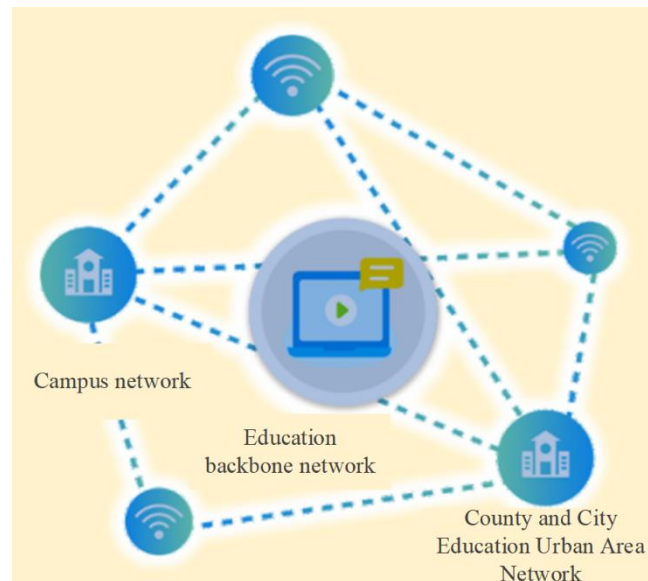


Figure 1: Educational Network Comprehensive Construction by the End of 2023

2) *Construction and promotion model: adopting coordinated planning and hierarchical responsibility:* The autonomous region plans the educational network comprehensively, with the Education Department responsible for the construction and operation of the educational backbone network. The backbone network is organized by the Guangxi Education Data Center as the main center, with main nodes in Nanning and Guilin of the China Education and Research Network (CERNET) and 10 university city nodes. Twelve universities are responsible for the operation of backbone network nodes. Municipalities and counties are responsible for the construction and operation of their regional educational metropolitan area networks. It ensures unified standards, standardized exports, i.e., unified technical standards for the educational network, standardized internet exports, unified network security protection, enhancing the network security protection capabilities of the educational network. It also requires unified construction and operation, i.e., based on districts and counties, unified procurement of network services from operators, with operators providing unified construction and operation services, thereby reducing the burden on schools [6-7].

B. Construction of the "Internet + Education" Platform

Currently, there are problems in the construction of the "Internet + Education" platform across the region, as shown in Table 2 below: In response to the aforementioned issues, the implementation of the Smart Education Platform Construction Project aims to construct the Guangxi Smart Education Platform with interoperable data, shared resources, and comprehensive applications. It advocates the "Platform + Education" service model, establishing a "1+6+N" educational digital platform system to accelerate the overall digital transformation, intelligent upgrading, and integrated innovation of education in the region, thus shaping a new development pattern for educational digitalization. "1" refers to the integrated educational digital infrastructure and unified education application service portal across the region, "6" refers to the construction of a unified organization

center, application center, data center, resource center, Internet of Things center, and message center for the entire educational system, while "N" refers to various types of educational digital applications. The "Platform + Education" service model relies on the platform to establish a unified and credible identity authentication system for education users across the region, promoting interconnection, interoperability, and collaborative sharing of various levels and types of educational resources, applications, and services. It provides a real-name network learning space for schools and teachers and students at all levels, comprehensively carrying various educational resources, applications, and services to support high-quality education development effectively [8-9]. The overall architecture is depicted in Figure 2 below.

There are two modes of construction and operation: 1. Government-enterprise cooperation: The Education Department of the autonomous region has selected the construction and operation entity for the platform through open selection. A platform-oriented technology company in the autonomous region has established an educational technology company to undertake the construction and operation of the "Guijiaotong" platform. It collaborates with leading companies and professional institutions in the field of educational digitalization to build the digital infrastructure, application support system, and business application system of the "Guijiaotong" platform, develop application software and tools, and provide educational digital application services. 2. Establishment of an Educational Digital Development Ecological Alliance: Leveraging the technical and talent advantages of local platform-oriented enterprises, the Guangxi Educational Digital Development Ecological Alliance is formed.

Table 2: Problems in the Construction of the "Internet + Education" Platform

Lack of Unified Entry Points and Data Interoperability	Scattered Investment in Informatization Issues of Redundant Construction	High Procurement Costs Low Supply Efficiency	Insufficient Network Security Capability Occasional Data Leakage
1) Various types of application entry points at the national, provincial (regional), municipal, county, and school levels are not unified, and account systems are not standardized, requiring teachers and students to record numerous addresses and accounts.	1) Some educational administrative departments lack sufficient coordination in information system planning, resulting in scattered investments and redundant construction.	1) Schools find it difficult to find mature information products and services, and customization requires significant investment.	1) Schools have insufficient understanding of network security policies and requirements, lacking security products and professional operational capabilities.
2) Data interoperability between systems is lacking, with data not being shared between various levels of educational administrative departments and schools.	2) Dispersed construction leads to inconsistent data standards, affecting data aggregation and effective utilization.	2) Procurement procedures for school information products and services are complex, with long cycles, failing to respond to needs in a timely manner.	2) Dispersed application deployments make it difficult for educational administrative departments to conduct data security supervision and protection.
3) Data is scattered, of low quality, unable to be fully utilized, and thus unable to effectively support scientific decision-making and evaluation.	3) Dealing with numerous system vendors increases operational difficulties, with demands not being addressed in a timely manner, thus affecting the normal use of business systems.	3) There are few channels for supplying information products and services to schools, making it difficult for enterprise products and services to enter schools, especially in primary and middle schools.	3) The severe network security situation poses a high risk of personal information leakage for school teachers, students, parents, etc.

Through the four-party joint construction model of "government organization - higher education institutions research - enterprise construction - school participation," resources and ecology are organized, standards are formulated, scientific evaluations are conducted, and research results are achieved. By developing, introducing, and producing, an open "Internet + Education" new ecosystem is built, creating a mutually beneficial and innovative joint entity. It actively explores new formats and models of digital education services, enhancing educational digital service capabilities [10]. The implementation plan is shown in table 3.

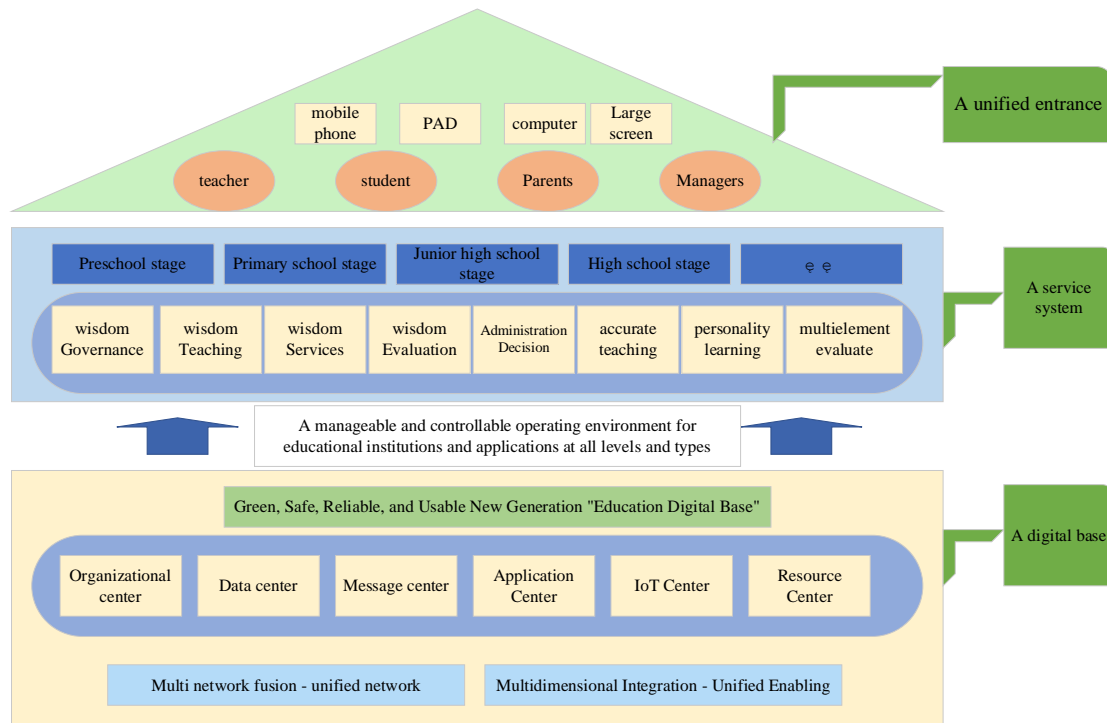


Figure 2: Overall Architecture of the "Internet + Education" Platform Construction

Table 3: Implementation Plan of the "Internet + Education" Platform Construction

Implementation Phase	Implementation Years	Implementation Plan Content
Online Trial Operation	2020-2021	Released the first version of the "Guijiaotong" service portal. Conducted trial operation of the "Guijiaotong" WeChat Mini Program and the "Guijiaotong" PC website platform. Completed the development and integration of the initial batch of "Guijiaotong" applications. Established the organizational structure of "Guijiaotong" users. Conducted pilot application work in some schools.
Pilot Applications	By the end of December 2023	Preliminarily completed the construction of the main architecture of the "Guijiaotong" platform. Released the "Guijiaotong" platform application access specifications, technical development specifications, data standard specifications, and IoT service standards. Gradually completed the access of various platforms and existing applications, achieved unified user authentication and single sign-on. Launched the Guangxi Education Application Center, promoted the initial scale of application ecosystem construction, and formed an application matrix covering educational management, teaching, resources, evaluation, and other scenarios. Organized regional application pilot projects and provide application training.
Comprehensive Promotion and Application	By the end of December 2024	By the end of December 2024, promote the use of the "Guijiaotong" platform throughout the education system in the region. Continuously carry out iteration, optimization, and upgrading work for the "Guijiaotong" platform. Enrich the application scenarios of the platform continuously. The supporting policies and institutional systems are basically sound. The operation mode of the platform is basically mature. The user base basically achieves full coverage of the education system in the region, forming initial scale effects.

C. Construction of Digital Campuses/Smart Campuses:

According to the provisions of the Ministry of Education's Guidelines for the Construction of Digital Campuses in Higher Education Institutions (Trial Implementation), it is planned to establish 7 demonstration units of undergraduate universities for building smart campuses and 30 construction units of benchmark vocational colleges according to the provisions of the Ministry of Education's Norms for the Construction of Digital Campuses in Vocational Colleges. Through the construction of digital campuses and smart campuses in undergraduate universities and vocational colleges, it is expected to play a demonstrative and leading role in

improving the level of smart campus construction in universities and accelerating the digital transformation of higher education.

IV. CONCLUSIONS

Splendid achievements have been made in the midst of China's educational informatization construction process, and digitalization in education is accelerating with unprecedented breadth and depth, laying a solid foundation for China's advancement towards intelligent education. Additionally, it provides a basis, direction, and methods for the digitalization construction of education in ethnic minority areas. In the new development stage of building China into a strong education country with Chinese characteristics, the successful transformation of education digitalization in ethnic minority areas can serve as a splendid demonstration in promoting high-quality education development in ethnic minority areas and further advancing the development of education digitalization transformation.

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