

# Education Digital Transformation Empowering Teacher Development in Ethnic Minority Regions: Sichuan's Practice and Theoretical Exploration of the Virtual Teaching and Research Community Mode

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## Abstract

As a strategic engine driving educational modernization and forging a strong sense of community for the Chinese nation, educational digitalization plays a pivotal role in breaking through the bottlenecks restricting educational development in ethnic minority regions. Sichuan Province has innovatively constructed a “virtual teaching and research + teacher community” model, leveraging digital technologies to transcend temporal and spatial limitations, reshape the educational ecosystem, and promote the precise dissemination of high-quality resources to rural classrooms. Based on the provincial-level project of Sichuan Normal University—Construction and Practice Research on the “1+1+N” Virtual Teaching and Research Community Model for Rural Language and Character Education in Sichuan's Ethnic Minority Regions—this paper conducts an in-depth analysis of the internal logic and practical paths through which this model empowers teachers' professional development and improves the quality of national common language and character education. It aims to provide a paradigm with both theoretical reference and practical value for the high-quality development of education in ethnic minority regions in the new era, serving the optimization of national educational policies, the deepening of practical improvements, and the improvement of theoretical systems.

## Keywords

educational digitalization in ethnic minority regions  
virtual teaching and research office  
teacher development community

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# 1. Strategic Implications and Practical Value of Educational Digital Transformation in Ethnic Minority Regions

Educational digitalization constitutes a core component of national strategic arrangements<sup>[1]</sup>, holding profound significance for resolving the predicaments in language education in ethnic minority regions and promoting social integration. Sichuan Province has taken the lead in exploration, leveraging digital technologies to build efficient pathways for language education<sup>[2]</sup>. Through virtual teaching and research offices, high-quality educational resources from core regions such as Chengdu and Mianyang have been directly delivered to remote classrooms in Ganzi, Liangshan, and other areas, realizing a qualitative leap in educational assistance from “one-way input” to “two-way mutual progress.”

Particularly crucial is that the “teacher development community” driven by digitalization has effectively broken the isolated state of traditional teaching and research. Relying on national platforms, Sichuan has constructed a three-level “teaching and research collaboration network” spanning provinces, counties, and schools, enabling real-time interaction and resource sharing<sup>[3]</sup>. Teachers have transitioned from passive recipients to active creators, with their abilities in teaching reflection and design significantly enhanced, converging into a core driving force for improving student development.

Sichuan’s practice strongly demonstrates that supporting the construction of teacher communities through digital transformation can effectively promote the parallel advancement of popularizing national common language education and safeguarding cultural diversity, thereby opening up a path for systematic reform in the modernization of education in ethnic minority regions.

## 2. Educational Digitalization in Ethnic Minority Regions, Virtual Teaching and Research Offices, and Teacher Development Communities: A Literature Review

### 2.1. Research on Educational Digitalization in Ethnic Minority Regions: Tensions Between Policy-Driven Approaches and Cultural Adaptation

Existing studies exhibit a notable characteristic of “strong

policy orientation and weak cultural adaptation.” Paths of technological empowerment primarily focus on issues of infrastructure coverage and resource supply. Relevant reports generally point out that although hardware coverage has improved, “technological disconnection” caused by insufficient digital literacy among teachers and equipment idleness constitute major challenges<sup>[4]</sup>. The cultural adaptation path, on the other hand, focuses on the interactive integration of digital technologies and ethnic cultures. Early practices drew on “culturally responsive teaching” (Ladson-Billings), emphasizing resource localization; subsequent critical studies have warned of the need to balance the risks of “homogenization” and “isolation,” advocating for in-depth mutual embedding<sup>[5]</sup>. Despite UNESCO’s promotion of “culturally responsive digital education,” domestic research remains insufficient regarding how cultural cognitive differences profoundly affect technological effectiveness.

### 2.2. Research on Virtual Teaching and Research Offices: Evolution from Technological Transplantation to Cultural Integration

The research process can be divided into three stages:

Theoretical introduction and technological transplantation (2000–2015): Focused on conceptual definition and the construction of technical frameworks, initially realizing basic functions but facing dilemmas such as insufficient collaboration depth and lack of cultural adaptability<sup>[6]</sup>.

Practical exploration and mechanism innovation (2016–2020): Research shifted its focus to the design of collaboration mechanisms. Policy-driven efforts gave rise to new forms, while conflicts between technical tools and specific cultural contexts became prominent<sup>[7]</sup>.

Ecological construction and cultural integration (2021–present): Three major shifts have emerged: from instrumental rationality to cultural rationality, from administrative-driven to community autonomy, and from resource aggregation to wisdom generation<sup>[8]</sup>.

### 2.3. Research on Teacher Development Communities: Paradigm Evolution and Challenges in Ethnic Contexts

The evolutionary context of research is clear:

Professional learning community stage (1990–2000):

Based on theories by Hord et al., it emphasized collective reflection and collaboration to deconstruct “professional individualism.” Studies confirmed the necessity of institutional support, but under the administratively led model in ethnic minority regions, it easily fell into cultural adaptation dilemmas such as “formal participation.”

Practice community turn (2000–2010): Wenger’s Community of Practice (CoP) theory and the mechanism of “legitimate peripheral participation” became core concepts. While effective in school-based teacher training in eastern regions, in ethnic minority regions characterized by high teacher mobility and significant cultural heterogeneity, building community cohesion faces severe challenges.

Value co-creation paradigm development stage (2010–present): Represented by Prahalad & Ramaswamy’s value co-creation theory and Vargo & Lusch’s Service-Dominant Logic (SDL) theory, it focuses on teachers’ role transformation as value co-creators. Domestic empirical studies have shown that this model facilitates innovation in cross-cultural teaching strategies, but discussions on in-depth issues such as the transformation of cultural capital and the reconstruction of power relations remain to be deepened<sup>[9]</sup>.

### **3. Diagnosis of Core Issues: In-depth Challenges in Constructing the Virtual Teaching and Research Community Model**

#### **3.1. Dilemma of Adaptation Between Cultural Logic and Technical Logic**

Ethnic education shoulders the dual mission of implementing national curricula and inheriting ethnic cultures. However, current digital resources often neglect cultural particularities. This study urgently needs to explore: How can virtual teaching and research offices effectively promote the creative transformation of “universal educational resources and local cultural knowledge”? How can the design of technical tools accurately adapt to the cognitive habits and cultural contexts of ethnic minority teachers?

#### **3.2. Crux of the Lack of Endogenous Motivation in Community Construction**

Traditional teacher development models overly rely on administrative directives, resulting in insufficient subjective participation of teachers. Data shows that in 2023, the participation rate of teachers in cross-school teaching and research activities in Sichuan’s ethnic minority regions was only 12%, and most of these participations were “task-driven.” This study needs to conduct in-depth exploration: How can virtual teaching and research offices stimulate teachers’ endogenous motivation for self-organized professional growth by building community networks and activating the accumulation of cultural capital?

#### **3.3. Imbalance in the Teaching and Research Ecosystem Integrating Virtual and Offline Elements**

Current virtual teaching and research offices tend to “emphasize online forms over practical closed loops.” Case studies indicate that teachers’ online activity is disconnected from the effectiveness of classroom teaching improvement, and the risk of “digital formalism” has emerged. In view of this, this study needs to focus on exploring: How to construct a value closed loop of “online collaboration—offline practice—data-based evidence”? How to guide the effective transformation of teaching and research results into teaching practice through dynamic and process-oriented evaluation mechanisms?

### **4. Empirical Study: The “1+1+N” Virtual Teaching and Research Office Teacher Development Community Model in Sichuan’s Ethnic Minority Regions**

This study is rooted in the dual strategic requirements of the national “Educational Digitalization Strategic Action” and “forging a strong sense of community for the Chinese nation.” It focuses on three core challenges faced by teacher development in ethnic minority regions: fragmented school distribution due to complex geographical environments, diverse teaching scenarios arising from the coexistence of multi-ethnic cultures, and exacerbated development imbalance caused by lagging

educational resource supply. Through building a multi-node collaborative network, virtual teaching and research offices transform county-level schools and rural teaching sites into “micro-centers” of resources, subverting the traditional one-way resource allocation model of “urban center—ethnic minority periphery.” They empower teachers to transition from “resource consumers” to “knowledge producers,” achieving collaborative co-construction, cultural translation, and value co-creation, and ultimately forming a closed-loop ecosystem of “teaching practice—teaching research reflection—research improvement.”

#### 4.1. Research Objectives

At the theoretical level, this study aims to construct a “culture-technology-ecology” three-dimensional collaborative theoretical model of teacher development communities, revealing the deep-seated mechanisms through which virtual teaching and research offices drive the sustainable professional development of teachers; and propose a trinity innovative path for digital popularization of the national common language, namely “precision supply—local transformation—dynamic evaluation.” At the practical level, it seeks to establish a virtual teaching and research office system characterized by “one mainstay (Sichuan Normal University)—three branches (regional centers such as Xichang Ethnic Preschool Teachers College)—multiple nodes (school nodes in ethnic minority regions)—extensive connections”; cultivate a backbone teacher team with digital literacy, cultural inheritance awareness, and the ability to teach the national common language and characters; develop resource libraries and teaching toolkits with ethnic cultural characteristics; and condense the “Sichuan Model” featuring “intellectual leadership by universities—regional collaborative linkage—-independent teacher development.”

#### 4.2. Research Content Framework: Constructing a Three-Level Linked Virtual Teaching and Research Subsystem

The history subject group leads the “forging a strong sense of community for the Chinese nation” teaching and research group, developing educational resources infiltrated with community ideals, and strengthening historical identity and cultural mutual learning

capabilities. The education subject group leads the “professional literacy + putonghua” integrated teaching and research group, enhancing the ability to deeply integrate national common language teaching with subject expertise. The music subject group leads the “traditional culture infiltration” teaching and research group, exploring practical paths for organically integrating fine traditional Chinese culture into subject teaching.

#### 4.3. Project Implementation Path

In the preliminary research and system design stage, in-depth investigations were conducted in Xichang Ethnic Preschool Teachers College, rural teaching sites in Puge County, etc. Relevant national and Sichuan provincial policies were systematically sorted out, and the logical framework and implementation plan for virtual teaching and research offices to drive teacher communities were scientifically designed. In the stage of exploring collaboration mechanisms and building structures, a three-level collaborative structure of “mainstay (Sichuan Normal University, overall coordination and leadership)—fulcrum (Xichang Ethnic Preschool Teachers College, etc., regional radiation)—nodes (county-level schools, practice implementation)” was constructed, laying the foundation for a cross-level and interdisciplinary teaching and research network. In the stage of deepening construction and advancing practice, relying on the three-level structure, mixed teaching and research of “in-depth online collaboration + grounded offline practice” was implemented; discipline-specific “hand-in-hand” precision pairing assistance was carried out to improve the professional capabilities of Xichang Ethnic Preschool Teachers College and the literacy of its graduates in serving rural education; thematic teaching and research was promoted in pilot areas such as Puge County, focusing on enhancing teachers’ ability to teach the national common language and characters and their subject professional literacy. In the stage of summarizing effectiveness and promoting the model, data from the entire process were integrated to systematically evaluate the actual effectiveness of virtual teaching and research offices in promoting the popularization of putonghua; core achievements and replicable experiences were condensed, and the “Sichuan Model” was promoted through multiple channels.

#### 4.4. Construction Achievements

A virtual teaching and research office system was built. One “1+1+N” teacher development community virtual teaching and research office was successfully established, 3 practice bases of national language and character promotion bases were awarded, covering multiple schools in ethnic minority regions, a backbone teacher team was cultivated, and a collaborative model of “university leadership—county-level coordination—teaching site implementation” was initially formed. Teaching and research as well as training activities were carried out. 5 subject-specific virtual teaching and research activities were organized, covering over 400 teachers; 8 online-offline integrated research and training sessions were held for the “Learning Putonghua in Preschool” project, benefiting nearly 300 preschool teachers in Ganzi and other regions; a 3-month “online + offline” special training program for improving teachers’ putonghua proficiency was implemented in Seda County, Ganzi Prefecture, innovatively adopting the model of “four major curriculum modules + personalized precision tutoring.” A series of core achievements were produced. The Research Report on the “Learning Putonghua in Preschool” Project was released, proposing systematic paths for teacher development, curriculum optimization, and management mechanism innovation.

### 5. Policy Recommendations: Deepening Transformation and Collaborating to Overcome Challenges

#### 5.1. Strengthening Top-Level Design and Collaborative Mechanisms

Integrate the promotion of the national common language and characters in ethnic minority regions into the core agenda of the provincial educational digitalization strategy, and closely align it with the Sichuan Provincial Educational Digitalization Action Plan (2025–2027). Establish an efficient cross-departmental collaboration mechanism to coordinate the allocation of resources and policies, and resolve the predicament of “multiple management and fragmented resources.” Clearly formulate roadmaps and timetables for key projects such as “virtual teaching and research office construction,” “teacher community cultivation,” and “digitalization

of ethnic cultural resources” to ensure the orderly implementation of tasks<sup>[10]</sup>.

#### 5.2. Stimulating Endogenous Motivation and Optimizing the Ecosystem for Teacher Development

Deepen teacher training. Rely on provincial universities and high-quality resources to build a multi-level, modular training system, combining online and offline methods to conduct special training on putonghua teaching methods, subject integration, etc<sup>[11]</sup>. Add compulsory modules such as “Education on the Awareness of the Community for the Chinese Nation” and “Integration of Ethnic Culture and Language Education” to deepen teachers’ recognition of the dual mission of “promoting putonghua” and “safeguarding cultural diversity.” Innovate training mechanisms. Encourage universities to collaborate with ethnic minority regions in targeted training of education postgraduates to reserve high-quality backbone teachers. Improve incentive mechanisms. Scientifically incorporate teachers’ substantive achievements and contributions in national common language and character teaching and research into evaluation systems such as professional title assessment and performance appraisal, creating a favorable atmosphere where teachers actively participate and are willing to innovate<sup>[12]</sup>.

#### 5.3. Emphasizing Practical Effectiveness and Improving the Teaching and Research Evaluation System

Promote the virtual teaching and research model of “university leadership—county-level coordination—teaching site implementation,” and strengthen the core supporting role of universities and research institutions in the three-level teaching and research network. Support county-level schools in establishing “micro-centers” for teaching and research, encourage teachers to develop ecological and localized teaching resources through cloud collaboration, and enhance their independent development capabilities. Establish a scientific teaching and research evaluation system, with core assessment indicators including the conversion rate of teaching and research achievements into teaching practice, the improvement of teaching quality, and the progress of students’ language proficiency, focusing on evaluating teachers’ ability



to innovate in teaching practice<sup>[13]</sup>. Regularly organize exhibitions of outstanding achievements and experience exchanges to give play to the demonstration and radiation effects of typical cases.

#### 5.4. Strengthening Multi-Stakeholder Collaboration and Consolidating the Joint Effort for “Putonghua Promotion”

Construct a collaboration mechanism of “intellectual leadership by universities—regional collaborative linkage—independent teacher development”: Universities focus on providing theoretical support, intellectual input, resource guarantees, and high-end training, leading educational research, curriculum development, and evaluation; local colleges actively participate in teaching and research activities, deepen resource sharing through joint training and teacher exchanges; schools in ethnic minority regions take the initiative to connect with project resources, actively introduce and carry out localized innovative applications. Mobilize the strength of the whole society to form a strong joint effort to synergistically promote national common language and character education.

## 6. Conclusion

Educational digitalization is a key path in the new era to forge a strong sense of community for the Chinese nation and promote high-quality and balanced development of education in ethnic minority regions. The practice

of Sichuan’s “virtual teaching and research office + teacher development community” model has shown that integrating resources, improving teachers’ literacy, and promoting in-depth cultural integration through digital means can effectively address challenges in the promotion of the national common language and characters, such as resource barriers, insufficient endogenous motivation, and imbalanced teaching and research ecosystems, thereby injecting lasting momentum into the high-quality development of education in ethnic minority regions<sup>[14]</sup>.

Looking ahead, it is still necessary to continuously strengthen policy synergy and consolidate consensus and efforts from all parties; deepen the cultural and technical adaptability of resources to meet diverse educational needs; and fully stimulate the vitality of the teaching workforce to comprehensively improve educational quality<sup>[15]</sup>. We should promote the expansion of “digital empowerment” from local pilots to full-scale and in-depth coverage, enabling national common language education to truly become a “bridge of connection” for promoting ethnic unity and a “stabilizer” for safeguarding cultural diversity.

In the journey of the great rejuvenation of the Chinese nation, we will cultivate more new-era talents in ethnic minority regions who possess a profound sense of the Chinese nation community, rich cultural heritage, and excellent professional literacy, allowing them to shine in the new era and lay a solid talent foundation for national prosperity and social progress.

#### Disclosure statement

The author declares no conflict of interest.

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