

Exploring the Construction of a 5G Smart Traditional Chinese Medicine and Classical TCM Teaching & Research Base

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Abstract: The state places great emphasis on the inheritance, innovation, and development of Traditional Chinese Medicine (TCM), while the global wave of digital technology brings both opportunities and challenges to higher education in TCM. At present, many clinical teaching bases of TCM face problems such as uneven allocation of teaching staff, low utilization efficiency of teaching equipment, insufficient cultivation of classical TCM, and inadequate integration of modern information technology with traditional teaching models. Based on the teaching reform practices of Dongguan Traditional Chinese Medicine Hospital (the Ninth Clinical Medical College of Guangzhou University of Chinese Medicine), this paper proposes a conceptual framework for the construction of a “5G Smart TCM and Classical TCM Teaching & Research Base.” This model integrates cutting-edge technologies such as 5G and artificial intelligence with the wisdom of classical TCM, aiming to build an innovative talent cultivation ecosystem characterized by “smart empowerment, classical foundations, optimized faculty, resource sharing, and cultural reconstruction.” The paper systematically elaborates on the project background, core connotations, implementation pathways, feasibility support mechanisms, and expected outcomes of this model, providing a replicable “new TCM paradigm” for similar medical colleges and clinical teaching bases nationwide, and contributing to the cultivation of composite, interdisciplinary, and high-caliber TCM professionals.

Keywords: 5G smart traditional Chinese medicine; classical traditional Chinese medicine; clinical teaching base; teaching reform; composite talent cultivation

Introduction

Traditional Chinese Medicine is a treasured legacy of Chinese civilization. How to effectively inherit, develop, and utilize it in the new era constitutes a central issue for TCM educators. Multiple government departments have issued policies

emphasizing the deepening of medical–educational collaboration, strengthening the cultivation of TCM thinking, and promoting the integration of information technology with teaching. However, in clinical teaching practice, the cultivation of high-quality TCM professionals still faces numerous bottlenecks. The



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inheritance of classical TCM learning encounters significant difficulties: many teaching bases lack in-depth study of classical texts and fail to effectively construct a diagnostic and treatment thinking system based on syndrome differentiation, thereby affecting clinical efficacy. The application of new-generation information technologies in TCM education often remains at the conceptual level, with a lack of systematic and practical implementation scenarios^[1]. In addition, structural contradictions within faculty teams, the idling of high-quality teaching resources, and weak awareness of clinical teaching responsibilities further exacerbate the imbalance in talent cultivation quality. Against this backdrop, Dongguan Traditional Chinese Medicine Hospital, leveraging its institutional strengths, has proactively proposed a reform initiative to “explore the construction of a 5G Smart TCM and Classical TCM Teaching & Research Base.” This study systematically demonstrates the necessity and feasibility of this initiative and outlines its implementation pathway, with the aim of providing practical insights for the connotative development of higher education in Traditional Chinese Medicine.

1. Current Review: Challenges and Opportunities Faced by Clinical Teaching Bases of Traditional Chinese Medicine

Since becoming a non-directly affiliated teaching hospital of Guangzhou University of Chinese Medicine in 2007, Dongguan Traditional Chinese Medicine Hospital has established a full-chain talent cultivation system and achieved remarkable outcomes in disciplinary development and scientific research. However, a critical review of its current situation, as well as that of clinical teaching bases across Guangdong Province, reveals multiple challenges. First, the connotative cultivation of classical TCM is insufficient. An overemphasis on clinical techniques while neglecting theoretical principles has led to superficial understanding and inflexible application among students, deviating from the core principle of syndrome differentiation and treatment. Second, the integration of modern technologies with TCM education remains superficial. The application of artificial intelligence (AI), big data, and related technologies is still at an early stage, and practical challenges persist in implementing 5G- and AI-enabled

teaching models. Third, structural imbalances exist within faculty teams: resources are concentrated in popular disciplines, while teachers in less prominent specialties are scarce. Moreover, some clinicians are proficient in practice but lack pedagogical competence, which negatively affects the quality of clinical teaching. Fourth, high-quality teaching resources are underutilized. Simulation teaching equipment and other facilities are often left idle due to inadequate management and weak alignment with curricular content. Finally, the culture of clinical teaching has been weakened. In some cases, instructors regard interns merely as auxiliary labor, bedside teaching is simplified, and clinical practice opportunities become largely formalistic. Nevertheless, these challenges coexist with significant opportunities. As a jointly established hospital, Dongguan Traditional Chinese Medicine Hospital has received strong support from the municipal government in multiple dimensions and has participated in national projects led by the Ministry of Industry and Information Technology. Through these initiatives, the hospital has accumulated experience in 5G infrastructure development and technological application, thereby laying a solid foundation for further teaching reform.

2. Core Concept: Constructing a New Teaching and Research Paradigm Driven by the Dual Wheels of “5G Smart” and “Classical TCM”

In response to the above issues, this project proposes a core solution: the construction of an innovative teaching and research base driven by the dual wheels of “5G smart” technology and “classical TCM.” Rather than merely superimposing advanced technologies onto traditional teaching models, this approach aims to achieve deep integration and mutual empowerment between the two at both philosophical and practical levels.

2.1 “5G Smart TCM”: Injecting New Momentum into Traditional Teaching

“5G Smart TCM” in this context is not an isolated technological concept, but a comprehensive teaching empowerment system built upon 5G networks and integrated with artificial intelligence, the Internet of Things, big data, and virtual/augmented reality (VR/AR) technologies. Its core values are reflected in

several aspects. First, it breaks through temporal and spatial constraints to enable the sharing of high-quality resources. By leveraging 5G-enabled 4K/8K ultra-high-definition video technology, remote real-time teaching ward rounds and live broadcasts of consultations on difficult cases conducted by nationally renowned TCM masters and senior physicians can be realized. This allows students in different regions to experience expert instruction in an immersive manner. Second, it enhances teaching efficiency and precision. AI technologies can be applied to assist in the acquisition and analysis of information obtained through the four diagnostic methods of TCM (inspection, listening and smelling, inquiry, and palpation)^[2]. For example, high-precision image recognition can be used to objectively quantify tongue coating and facial complexion, while intelligent pulse-diagnosis devices can collect pulse data and compare it with classical pulse diagnosis theories. These objective data not only support clinical diagnosis but also serve as vivid teaching cases, helping students better understand abstract TCM theories. Third, it helps construct immersive learning environments. Through VR/AR technologies, virtual laboratories for classical formula compatibility, three-dimensional anatomical models of meridians and acupoints, and even simulated historical scenarios of ancient physicians diagnosing patients can be created. Such highly realistic environments enable students to engage in repeated practice, thereby deepening their understanding and retention of classical knowledge.

2.2 “Classical TCM”: Anchoring Smart Teaching in Its Cultural Soul

While embracing modern technology, it is essential to firmly safeguard the “root” and “soul” of Traditional Chinese Medicine—its classical foundations. This project emphasizes that the ultimate purpose of all smart and digitalized approaches is to better serve the learning, understanding, and application of classical TCM. Therefore, the construction of the teaching and research base must be guided by the core orientation of “learning the classics, applying the classics, and transmitting the classics.” First, the curriculum system should be restructured. The study of classical texts should be embedded throughout the entire talent cultivation process. A dedicated Classical TCM Teaching and Research Office should be established,

supported by a teaching team led by senior experts. A series of specialized courses should be developed, including systematic interpretations of classical texts, applications of classical formulas, and analyses of renowned physicians' clinical cases. Second, clinical thinking training should be strengthened. By regularly organizing case discussion seminars focused on classical TCM therapies and holding competitions on the application of classical formulas, students can be guided to actively apply theoretical frameworks—such as the six-meridian differentiation system from the *Treatise on Cold Damage (Shanghan Lun)* and the zang–fu differentiation system from the *Essential Prescriptions of the Golden Chamber (Jingui Yaolüe)*—to real or simulated clinical scenarios. This process fosters independent thinking and enhances the ability to address complex clinical problems. Third, a cultural atmosphere that respects classical learning and values professional ethics should be cultivated. Through platforms such as master physician inheritance studios and national medicine clinics, the academic theories and clinical experience of senior and renowned TCM practitioners can be systematically organized, digitized, and preserved, transforming them into valuable teaching resources for living inheritance. In this way, students' cultural confidence in TCM and their sense of professional mission can be gradually and effectively strengthened.

The integration of “5G Smart” technology and “Classical TCM” is, in essence, the unification of instrumental means and guiding principles. The former represents efficient tools and carriers, while the latter embodies enduring values and ultimate goals. Only through such integration can a new generation of TCM professionals be cultivated—individuals who are proficient in modern technologies yet deeply grounded in traditional wisdom, capable of both innovative thinking and solid clinical practice.

3. Implementation Pathways: Systematic Advancement of Five Core Projects for the Teaching and Research Base

To ensure that the above concepts are effectively implemented, this project designs a systematic and step-by-step implementation plan, focusing on the advancement of the following five core projects.

3.1 Building an Integrated Teaching System Combining “5G Smart TCM” and “Classical TCM”

This project constitutes the cornerstone of the entire initiative. Specific measures include the following. First, smart teaching equipment will be introduced. Mature 5G-enabled smart TCM devices—such as intelligent tongue diagnosis systems, pulse diagnosis instruments, and remote consultation terminals—will be systematically integrated into the routine teaching and assessment of standardized resident training programs and undergraduate education. Second, integrated courses will be developed. Interdisciplinary courses such as “AI-Assisted Analysis of Correspondence Between Classical Formulas and Syndromes” and “Big Data–Based Mining of Medication Patterns of Renowned Senior TCM Physicians” will be designed and offered. These courses aim to enable students to experience, through practice, how modern technology can serve the deeper understanding and application of classical TCM knowledge^[3]. Third, a closed-loop evaluation and feedback mechanism will be established. The PDCA (Plan–Do–Check–Act) cycle will be employed to continuously track students' learning data and teaching outcomes. Through AI-assisted analysis and dynamic adjustment, a self-optimizing teaching feedback loop will be formed.

3.2 Establishing a High-Level and Balanced Interdisciplinary Mentor Pool

To address the issues of uneven faculty distribution and disparities in teaching capacity, the project will implement the following strategies. First, the faculty structure will be reorganized. Departmental boundaries will be broken down, and high-quality teaching resources from across the hospital and the university will be integrated to establish a dynamically updated and resource-sharing interdisciplinary mentor pool. Mentors from strong disciplines will be encouraged to provide targeted support to weaker disciplines, fostering the cultivation of discipline-specific teaching leaders. Second, standardized capacity-building will be implemented. Relying on the Faculty Development Center of Guangzhou University of Chinese Medicine, a comprehensive training and certification system will be established, covering four major modules: teaching theory, teaching ward rounds, case discussion, and research supervision. All clinical instructors will

be required to obtain certification before teaching, with annual reviews conducted to ensure sustained teaching quality. Third, incentive mechanisms will be strengthened. Indicators such as teaching quality and student evaluations will be deeply embedded into physicians' performance appraisal and professional title promotion systems. By granting substantive recognition to teaching contributions, this approach aims to fundamentally reshape the institutional culture toward one in which teaching is widely valued, actively embraced, and effectively delivered.

3.3 Establishing a Hospital-Wide Integrated Teaching Resource Sharing Platform

To activate underutilized high-quality resources, the project will implement the following measures. First, a smart management platform will be developed. An integrated teaching resource sharing platform featuring online reservation and centralized offline management will be established, bringing together all teaching resources, including standardized resident training bases, central laboratories, and renowned physician studios. This platform will promote the effective circulation and optimal allocation of teaching resources across the entire institution. Second, research resources will be fed back into teaching^[4]. Laboratories will be fully opened to undergraduate and postgraduate students, encouraging early exposure to scientific research and active participation in research projects. In addition, the academic essence of renowned physician studios will be systematically sort out and transformed into digital elective courses or thematic lectures, thereby enabling positive interaction and synergy between research platforms and teaching platforms.

3.4 Innovating Student-Centered Models of Clinical Teaching

To move beyond traditional lecture-based and passive teaching approaches, the project will promote several innovative strategies. First, a flipped mentoring model will be encouraged. Senior students and outstanding trainees will be supported in mentoring junior students, fostering independent thinking and the ability to articulate and apply knowledge. This approach shifts students from passive recipients of information to active constructors of knowledge. Second, standardized bedside teaching will be implemented. Each specialty will develop a standardized teaching ward-round

protocol consisting of five essential components: bedside inquiry, integrated application of the four diagnostic methods, syndrome differentiation analysis, formulation of treatment plans, and physician–patient communication. This protocol will be institutionalized as a mandatory component of routine clinical practice^[5]. Third, a culture of excellence guided by master teachers will be cultivated. Activities such as “demonstration ward rounds by master teachers” and “teaching-oriented discussions of difficult clinical cases” will be held on a regular basis, transforming exemplary individual teaching practices into a shared institutional culture of high-quality clinical education.

3.5 Establishing a Comprehensive Support and Evaluation System

To ensure the smooth implementation of the project, a dedicated task force will be established, composed of representatives from the Human Resources Department, the Department of Science and Education, the Standardized Resident Training Office, and heads of clinical departments. The project will follow a strategy of “pilot implementation first, followed by scaled promotion.” Initially, pilot programs will be conducted in one to two strong disciplines and one relatively weak discipline. Based on the experience gained and issues identified, the implementation plan will be refined before being extended across the entire hospital. At the same time, a comprehensive support framework will be established, encompassing organizational structures, application systems, assessment mechanisms, and evaluation systems. This integrated support network will ensure that all reform measures are well-regulated, evidence-based, and sustainably implemented.

4. Feasibility Analysis and Expected Outcomes

4.1 Feasibility Analysis

The implementation of this project is supported by a solid feasibility foundation. First, at the policy level, the project is highly aligned with the strategic objectives for the development of Traditional Chinese Medicine outlined in Dongguan's Fourteenth Five-Year Plan, particularly the “five-integration” development strategy, as well as the “Double First-Class” initiative of Guangzhou University of Chinese Medicine. As such, it benefits from strong top-down policy support. Second, at the resource level, the hospital is already

equipped with 5G infrastructure, a national standardized resident training base, central laboratories, and national medicine clinics, among other hardware platforms. In addition, it has access to a high-level talent team led by nationally recognized TCM masters, providing a comprehensive combination of both hardware and human resources. Third, at the organizational level, the hospital has established complete interdepartmental collaboration mechanisms and clearly defined divisions of responsibility. These organizational arrangements provide strong support for the efficient execution and coordinated advancement of the project.

4.2 Expected Outcomes

The expected outcomes of this project will be multidimensional.

First, in terms of academic achievements, an academic report entitled Exploring the Construction of a 5G Smart Traditional Chinese Medicine and Classical TCM Teaching and Research Base will be produced, and high-quality papers will be published in peer-reviewed journals, providing theoretical references for the academic community. Second, in terms of institutional achievement, a series of standardized and normative documents will be formulated and promulgated, including the Regulations on the Management of the Interdisciplinary Mentor Pool, the Certification Standards for Clinical Teachers' Teaching Competence, and the Standardized Bedside Teaching Workflow. These documents will institutionalize and consolidate the outcomes of the reform^[6]. Third, in terms of talent cultivation, the project is expected to significantly enhance students' mastery of classical TCM theory, their clinical capacity in syndrome differentiation and treatment, and their literacy in the application of modern technologies. As a result, a cohort of composite TCM professionals capable of meeting the demands of the new age will be cultivated. Fourth, in terms of long-term impact, the project will promote the transformation of the hospital from an “excellent clinically oriented hospital” into a “distinguished teaching and research-oriented hospital.” It aims to establish a third “golden hallmark” alongside clinical service and scientific research, while also explore a replicable and scalable innovative development pathway for higher education in Traditional Chinese Medicine nationwide.

Conclusion

Exploring the construction of a 5G smart Traditional Chinese Medicine and classical TCM teaching and research base is a systematic initiative rooted in present needs and oriented toward the future. It represents not only a profound reform of existing teaching models but also a sublimation of the essential values of TCM education. By integrating cutting-edge digital technologies with the profound wisdom of traditional culture, this approach has the potential to address many of the persistent challenges in the cultivation of TCM talents and to build a new educational ecosystem that both preserves centuries-old traditions and leads future development.

The practical exploration undertaken by Dongguan Traditional Chinese Medicine Hospital may serve as a vivid regional model from Guangdong Province for the principled innovation of TCM in the new era. Its significance extends beyond a single hospital or university, offering valuable insights and guidance for the high-quality development of the entire field of Traditional Chinese Medicine education.

References

- [1] Wang Zhanlin, Lin Xuejuan, Lu Yuhui, et al. Innovation of classical TCM teaching and research through cloud-based large-scale collaborative teaching. *Journal of Traditional Chinese Medicine Management*, 2025, 33(09): 228–230.
- [2] Jiang Lili. Reflections on the apprenticeship-based teaching model for TCM physicians and nursing professionals under the background of medical–education–research collaboration. *Journal of Traditional Chinese Medicine Management*, 2021, 29(17): 202–203.
- [3] Lin Yuan. Research and practice on the construction of an “industry–education–research–innovation” platform based on TCM professional clusters: A case study of the affiliated TCM school of Guangxi University of Chinese Medicine. *Journal of Guangxi University of Chinese Medicine*, 2021, 24(02): 123–126.
- [4] Ai Si, Zheng Jian. Strategies for cultivating postgraduate students in pediatric TCM based on the integrated reform model of medical care, education, and research. *Chinese Journal of Modern Distance Education of Traditional Chinese Medicine*, 2021, 19(04): 165–167.
- [5] General Office of the State Council. Guiding opinions on accelerating innovation and development in medical education. *Gazette of the Ministry of Education of the People's Republic of China*, 2020, (10): 10–14.
- [6] Ministry of Education and National Administration of Traditional Chinese Medicine. Guiding opinions on deepening medical–education collaboration to promote reform and development of Traditional Chinese Medicine education. *Gazette of the Ministry of Education of the People's Republic of China*, 2017, (11): 10–14.