

Exploration and Practice of Innovative Talent Cultivation Models for Master's Degree Students in Ethnic Medicine: A Case Study of Guangxi University of Chinese Medicine

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Abstract The cultivation of innovative talents has become the primary objective of talent development in colleges and universities and is also essential for the personal development of master's degree students. Ethnic medicine, a key discipline at Guangxi University of Chinese Medicine, aims to cultivate high-level master's degree talents who possess comprehensive qualities, strong innovative capabilities, and distinctive characteristics of Zhuang medicine. This program is designed to better serve the local economic development and social needs of Guangxi, thereby promoting the substantive advancement of higher education within traditional medical institutions.

Key words Ethnic medicine, Innovative talent, Master's degree student, Ability cultivation

0 Introduction

In the era of the knowledge economy, globalization is accelerating continuously, and the social economy is developing rapidly. Consequently, innovative thinking has become a core component of competitiveness. As the primary arena for talent development, higher education institutions are receiving increasing attention from society for their role in cultivating highly skilled and innovative professionals^[1]. Innovative talents constitute a critical force in preserving the essence of national culture and facilitating the integration of tradition with modernity. As a distinctive system embodying national culture and historical knowledge, ethnic medicine must not only uphold its traditional core but also adapt to contemporary scientific advancements and global healthcare needs. The cultivation of innovative talents is essential for the inheritance and advancement of ethnic medicine, fostering a synergistic relationship between traditional wisdom and modern innovation.

Guangxi University of Chinese Medicine (hereinafter referred to as "the University") is the sole independently established higher education institution specializing in traditional Chinese medicine among the five autonomous regions designated for ethnic minorities in China. Its educational programs exhibit distinct ethnic and regional characteristics. As a prominent and specialized discipline within the University's postgraduate education, the master's degree program in ethnic medicine (focusing on Zhuang medicine and Yao medicine) has consistently enrolled students pursuing

both academic and professional master of medicine degrees, thereby cultivating a significant number of highly qualified professionals in Zhuang and Yao medicine. In response to the demands of the times, the University has undertaken a series of explorations and practices aimed at developing an innovative talent cultivation model for master's degree students specializing in ethnic medicine. This model emphasizes the enhancement of innovative thinking, innovative capabilities, and scientific research skills^[2]. Consequently, the University has established a distinctive system for cultivating innovative talents among Zhuang medicine postgraduates. This system involves the formulation and optimization of training objectives, curriculum reform, scientific research training, practical application, and effectiveness evaluation. Furthermore, it integrates the promotion of innovative consciousness, thinking, and concepts throughout the entire educational process, with the objective of cultivating high-quality applied ethnic medical professionals who fulfill societal needs.

1 Current status of master's degree programs in ethnic medicine

With the support of multiple factors, including national policy incentives and financial assistance, the University successfully obtained authorization from the State Council's Degree Committee in 2006 to recruit students for academic and professional master's degree programs in ethnic medicine. The primary objective of talent cultivation is to emphasize the training of fundamental theories in ethnic medicine, clinical practical skills, and scientific research capabilities. The goal is to develop advanced professionals who possess a solid theoretical foundation, high proficiency in diagnosis and treatment, and strong research competencies. This framework is specifically designed to cultivate foundational talents that align with the practical needs of the Zhuang and Yao ethnic regions. After years of dedicated practice, the University has trained a substantial number of master's degree students specializing in Zhuang and Yao medicine. These students have acquired a

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thorough understanding of the fundamental theories and distinctive medical techniques associated with Zhuang and Yao medicine. Their contributions have been significant in advancing the medical and health industries and fostering the development of ethnic medicine.

In recent years, the author has observed that although the initially established training objectives and curriculum system were unified and the assessment methods standardized, the evaluation system exhibited several issues, including an overemphasis on publications rather than practical experience, prioritization of modern scientific research over traditional characteristics, and a focus on outcomes rather than processes. Such shortcomings have resulted in a significant homogenization of thinking among master's degree students specializing in ethnic medicine. Consequently, during their studies and after graduation, these students face challenges such as insufficient innovative capacity, which hinders their ability to meet the evolving demands of social development.

2 Reform concepts for cultivating innovative talents

In response to the current status of training for master's degree candidates in ethnic medicine, the University has revised and enhanced its talent development objectives and plans. The updated objectives integrate the inheritable and practical aspects of Zhuang and Yao Medicine with the requirements of contemporary medical advancements, incorporating mechanisms for industry-education-research integration, policy support, and interdisciplinary innovation. A systematic framework has been optimized across multiple dimensions, including Zhuang and Yao medical knowledge and disciplinary frontiers, scientific research thinking and competencies, clinical practice, and societal value.

The curriculum structure, supervisor composition, and practical collaborations have been refined and optimized to prioritize the development of innovative and multidisciplinary talents. This initiative seeks to establish a novel training model for master's degree candidates specializing in Zhuang and Yao medicine, one that simultaneously preserves the core principles of traditional medicine and promotes innovative capacities. Students are expected to acquire clinical reasoning skills specific to Zhuang and Yao ethnic medicine, attain proficiency in modern medical practices and scientific technologies, and cultivate an interdisciplinary knowledge base alongside innovative thinking, thereby forming a "trinity" competency framework.

The "trinity" competency framework utilizes a systematic educational model that emphasizes the integration of cultural heritage with modern medicine. It aims to develop students' comprehensive abilities across three dimensions: professional theory and practical skills; modern medical science and scientific research innovation; and traditional medicine from an interdisciplinary perspective. The framework seeks to develop advanced innovative professionals who possess a profound understanding of the core principles of Zhuang and Yao traditional medicine while also demonstrating the ability to meet the evolving requirements of contemporary medical and

scientific progress. The establishment of the "trinity" competency framework is reflected in the following aspects. (i) Cultivating a foundation in traditional medicine. Candidates pursuing a master's degree in ethnic medicine are expected to have a robust theoretical foundation in their field, as well as the capability to integrate theory with practical application. Candidates are encouraged to enhance their study of classical Chinese medicine texts and engage in comprehensive research on ancient ethnic medical literature under the guidance of a supervisor. This approach aims to develop competencies in textual verification, theoretical refinement, and digital archiving. Concurrently, focused learning and investigation of the distinctive diagnostic and therapeutic techniques of Zhuang and Yao medicine should be prioritized. Students are expected to systematically acquire a thorough understanding of the core theoretical framework of their discipline, encompassing foundational theories, diagnostic and therapeutic principles, pharmacology, and health preservation culture. Additionally, they should attain proficiency in ethnic-specific diagnostic and therapeutic methods, such as Zhuang medicine thread moxibustion therapy, Zhuang acupuncture, and Zhuang meridian therapy, and strengthen adherence to clinical procedural standards. (ii) Cultivating modern scientific research thinking. Research methods, including evidence-based medicine, data mining, and molecular biology, are incorporated into the training of master's degree students in ethnic medicine to promote the scientific validation of this field. Master's degree students are expected to acquire proficiency in contemporary clinical diagnostic and therapeutic methods, including imaging and laboratory testing, as well as evidence-based medicine approaches, to improve their comprehensive diagnostic and therapeutic skills. Throughout their studies, students should develop the ability to apply methods such as experimental design, statistical analysis, and molecular biology to investigate the pharmacological mechanisms and efficacy of Zhuang and Yao medicine. This research aims to promote the modernization of Zhuang and Yao medical theories, standardize medicinal products, and facilitate the translation of technological advancements, including the development of novel dosage forms and the pursuit of patent applications. Through rigorous scientific experimentation, students are required to validate the mechanisms of action and clinical efficacy of Zhuang and Yao medicine, produce high-quality research publications, and enhance their scientific writing capabilities. (iii) Cultivating an interdisciplinary perspective. The master's degree program in Zhuang and Yao medicine adopts an interdisciplinary approach, integrating knowledge from ethnic medical systems, public health, bioinformatics, anthropology, artificial intelligence, and related disciplines. This strategy aims to expand students' academic perspectives and equip them with advanced technologies to investigate contemporary interpretations and applications of traditional Zhuang and Yao therapeutic practices and medicinal materials. The program actively fosters and supports cross-disciplinary collaboration within Zhuang and Yao Medicine, promoting joint research initiatives among relevant teams to collec-

tively advance innovation within the discipline and enhance professional development.

3 Reform measures for cultivating innovative talents

3.1 Deep integration of clinical practice and scientific research, collaborative talent development The supervisor, as the principal individual responsible for the education and training of master's degree students, plays a critical role in fostering their research abilities and innovative spirit. A supervisor who demonstrates scholarly rigor, upholds integrity and competence, and actively engages in innovation serves as an essential foundation for the development of these students^[3]. The research and innovation capabilities of a supervisor, along with their practical skills, directly influence the quality of education received by innovative master's degree students. The University has consolidated resources from academic institutions, enterprises, medical facilities, research organizations, and cultural entities to develop innovative talents within the master of ethnic medicine program. By creating an educational ecosystem defined by "cross-sector collaboration, resource sharing, and complementary strengths", the University has adopted a "collaborative educational model" that surpasses conventional, isolated training approaches. This initiative promotes industrial competencies in drug development and standard formulation, resulting in a novel advancement propelled by the dual forces of "heritage preservation and innovation".

The *Guangxi University of Chinese Medicine Regulations on the Management of Master's Degree Program Supervisors*, revised in 2021, stipulate that master's degree supervisors should "employ diverse training methods to stimulate the innovative potential of master's degree students". The University employs a stringent selection process for appointing research supervisors in the field of ethnic medicine. Faculty members who exhibit a lack of initiative, possess limited research accomplishments, or demonstrate insufficient innovative capacity are ineligible for supervisory qualifications. In contrast, individuals who actively engage in innovation, undertake bold exploratory research, and attain substantial scientific breakthroughs receive more lenient policies and preferential consideration in student recruitment criteria. The University annually organizes research supervisors specializing in ethnic medicine to participate in various training programs and lectures, including the Master's Supervisor Training Program of Guangxi Higher Education Institutions and online sessions focused on "standardizing supervisor guidance practices to build a first-class graduate supervisor team". Additionally, we arrange targeted study visits for ethnic medicine research supervisors to domestic and international universities to promote learning and experience exchange, enhance teaching capabilities, and introduce advanced concepts in the training of ethnic medicine master's degree students from outside the university. In alignment with the objective of establishing a high-level research-oriented institution, we actively pursue innovative approaches to talent cultivation. The University implements a dual-track guidance model that integrates "master-apprentice in-

heritance with scientific research innovation". This approach involves inviting national-level intangible cultural heritage inheritors, esteemed practitioners of Zhuang medicine, and distinguished senior experts in traditional Chinese medicine to transmit the classical theories and unique techniques of Zhuang and Yao medicine through a master-apprentice mentorship framework. Concurrently, the University engages prominent contemporary medical and biomedical scholars as research mentors who provide regular lectures and supervise students in applying advanced technologies such as genomics and metabolomics. This guidance facilitates the investigation of the therapeutic mechanisms underlying Zhuang and Yao medicine and the analysis of active compounds in ethnic medicines, culminating in the publication of high-quality research articles. The University has further elevated academic standards and enhanced the innovative awareness and capabilities of its master's degree supervisors by establishing clinical bases for Zhuang and Yao ethnic medicine, laboratories, and heritage studios, alongside implementing supervisor development initiatives. These efforts enable supervisors to more effectively cultivate the innovative abilities of master's degree students and promote their comprehensive development.

3.2 Reform of curriculum system Curriculum reform constitutes a pivotal measure for improving the quality of ethnic medical education and facilitating the integration of traditional and modern medical practices. The development of a talent cultivation plan and curriculum system that reflects the unique characteristics of the Zhuang and Yao ethnic groups, while addressing the educational needs of master's degree students in ethnic medicine, holds significant importance. Such efforts contribute to meeting the demand for highly skilled professionals in both national and ethnic minority regions, comprehensively enhancing the quality of education for master's degree students, fostering their practical and innovative abilities, expanding their international outlook, and reinforcing their awareness of ethnic unity.

The original educational objectives for master's degree students enrolled in the University's ethnic medicine program were specifically developed to meet the practical healthcare needs of the Zhuang and Yao ethnic regions. Accordingly, the curriculum is firmly rooted in the traditional medical practices of the Zhuang and Yao peoples. The courses offered to master's degree students specializing in Zhuang medicine include: Introduction to Ethnic Medicine, Foundational Theories of Zhuang and Yao Medicines, Modern Medications and Formulations Commonly Used in Ethnic Medicine, Characteristic Therapeutic Methods of Zhuang Medicine, Characteristic Therapeutic Methods of Yao Medicine, Clinical Experience with Renowned Practitioners, and Classic Medical Case Studies.

The University has reformed and optimized its curriculum to cultivate master's degree students in ethnic medicine into medical professionals possessing distinctive expertise in Zhuang and Yao ethnic medicine, solid foundational knowledge, excellent clinical skills, and strong innovative thinking, enabling them to deliver

high-quality healthcare services to the public. This initiative, aligned with contemporary demands and informed by reform practices and research outcomes from relevant medical institutions, seeks to enhance the professional competence and innovative capabilities of master's degree students in ethnic medicine. The core of curriculum reform encompasses optimizing course structures, enhancing practical instruction, fostering interdisciplinary integration, advancing research capacity development, and simultaneously emphasizing cultural heritage and innovation. By modifying the proportion of required to elective course hours, redundant theoretical courses will be minimized, while the number of specialized elective modules and distinctive courses will be increased. These courses encompass traditional research topics such as Research on Common Diseases in Zhuang-populated Areas, Modernization of Zhuang Medical Diagnostic Techniques, Operational Standards for Zhuang and Yao Medical Techniques, Research on the Advantageous Diseases of Zhuang and Yao Medicine, Pharmacodynamic Experimental Research on Zhuang Medicine, Basic Research and Clinical Application Studies of Yao Medicine, and Clinical Efficacy Evaluation of Ethnic Medicine. Simultaneously, foundational courses in research methodology, including evidence-based medical research methods, statistical data analysis, and experimental design pertinent to ethnic medicine, will be provided. These courses are designed to equip master's degree students in ethnic medicine with proficiency in contemporary research tools such as SPSS, R programming language, and meta-analysis techniques. The reform of the curriculum system should focus on increasing its flexibility and relevance by incorporating experimental methods to validate the scientific basis of traditional diagnostic and therapeutic techniques. It should also emphasize strengthening theoretical knowledge and clinical skills training, promoting scientific research innovation, and facilitating the translation of research findings into practice. This approach aims to achieve a progressive integration of theory and practice, thereby enhancing master's degree students' abilities to address practical problems and to engage in innovative scientific research.

The reform of master's degree programs in ethnic medicine at the University should prioritize demand-driven strategies and distinctive developmental pathways. By optimizing program structures, enhancing practical training, promoting interdisciplinary integration, and preserving cultural heritage, the reform seeks to cultivate versatile professionals proficient in both the core principles of traditional medicine and contemporary scientific research methods. Future initiatives ought to strengthen policy support and international collaboration, improve standardization, and integrate resources effectively, thereby facilitating the sustainable development of ethnic medicine.

3.3 Scientific research training The University cultivates the academic innovation capabilities of master's degree students through rigorous research training, concurrently promoting the modernization and internationalization of ethnic medicine. This training strategically integrates the preservation of traditional medi-

cal theories of the Zhuang and Yao ethnic groups with the application of contemporary research methods, thereby ensuring a foundation grounded in the unique attributes of Zhuang and Yao medicine while adhering to current scientific standards.

The core objectives of research training include the following aspects. (i) Theoretical innovation capability. Under the mentorship of supervisors, students are guided to investigate the fundamental principles of classical texts or field medicine within their discipline, conduct systematic reviews of the current research landscape in specific areas of Zhuang and Yao medicine, and contribute to the reconstruction, modern interpretation, and advancement of the theoretical framework of Zhuang and Yao medicine. (ii) Technical verification capability. The University provides courses on fundamental scientific research methods and employs experienced researchers and professors to mentor students in conducting animal experiments and operating scientific instruments. It guides master's degree students specializing in Zhuang and Yao medicine to proficiently apply modern scientific methods to validate the efficacy and safety of ethnic medical diagnostic and treatment techniques. Additionally, experimental research is conducted utilizing the resources of the Key Laboratory of Zhuang and Yao Medicine at Guangxi University of Chinese Medicine. The University has established a dedicated fund to support master's degree students by organizing an annual forum for master's candidates and creating a specialized research fund aimed at facilitating applications for the inheritance and innovation project related to Zhuang and Yao medicine. Under the supervision of their advisors, students propose research topics and conduct studies focused on the screening of active ingredients and the clinical efficacy evaluation of Zhuang and Yao medicine. (iii) Achievement transformation capability. Under the supervision of a supervisor, students have the opportunity to publish high-quality research papers, apply for patents, and engage in the research and development of new drugs related to Zhuang and Yao ethnic medicine, as well as contribute to the standardization of diagnostic and treatment techniques. These activities collectively advance the research, standardized production, and clinical application of ethnic medicine. The supervisor guides master's degree students to participate in domestic and international academic conferences, where they present research findings in both Chinese and English and engage in scholarly exchanges related to their research. This process facilitates the integration of Zhuang and Yao ethnic medical research with international standards. (iv) Interdisciplinary integration capability. In collaboration with teams from pharmacy, chemistry, and bioinformatics, we employ omics techniques, including metabolomics and network pharmacology, to elucidate the mechanisms of action underlying Zhuang and Yao medicine. This approach addresses interdisciplinary challenges between Zhuang and Yao medicine and modern medicine, pharmacy, biotechnology, and related fields. Concurrently, it aims to resolve key bottlenecks that hinder the advancement of Zhuang and Yao medicine, thereby facilitating its progressive development.

3.4 Reform of evaluation system The reform of the evaluation system for the training of master's degree students in ethnic medicine constitutes a critical component in advancing the high-quality development of ethnic medical education and fostering collaborative innovation between traditional and modern medical practices. In response to the current status of master's degree training in ethnic medicine at the University, we have developed a multidimensional evaluation system tailored to the specific characteristics of the ethnic medicine discipline. This system integrates both the preservation of traditional knowledge and the encouragement of innovation, aiming to foster the comprehensive development of master's students specializing in Zhuang and Yao medicine.

3.4.1 Reform concept of evaluation system. The University adopts a dual focus on "inheritance and innovation" as the central principle guiding the reform of its multi-dimensional evaluation system. It prioritizes the development of students' abilities to inherit traditional ethnic medical theories while simultaneously emphasizing the cultivation of modern scientific research skills and clinical translation capabilities. Furthermore, the evaluation framework considers the academic development process of students, employing a dual-dimensional assessment approach that integrates both "process and outcome" measures. Additionally, social benefit indicators reflecting the dual value of "discipline and society", particularly in serving the medical and healthcare needs of the Zhuang and Yao ethnic regions, are incorporated.

3.4.2 Evaluation indicator. The evaluation indicators encompass assessments of academic proficiency, clinical practice competence, and capabilities in innovation and transformation. After completing three years of master's degree training, students specializing in ethnic medicine are expected to acquire specific academic competencies. These include the ability to independently interpret ancient texts and documents, reconstruct theories within ethnic medicine, author and publish high-level academic papers in SCI, SSCI, or other core journals, independently apply for patents, and undertake scientific research projects of varying scopes. Clinical practice competence necessitates that students proficiently perform the distinctive diagnostic and therapeutic techniques of Zhuang and Yao medicine in a standardized manner, as well as independently diagnose and manage common and complex clinical conditions, based on clinical decision-making assessments of real cases. The evaluation of innovation and transformation abilities requires students to demonstrate the capacity to apply evidence-based medicine principles, including the design of clinical trial protocols, such as randomized controlled trials (RCTs) for the Zhuang medical method.

3.4.3 Evaluation method. (i) Diversified evaluation subjects. A four-party scoring mechanism of "supervisor + five defense experts + college evaluation + external blind review evaluation" is

implemented to prevent reliance on a single evaluator and to maximize the objectivity and fairness of the assessment. (ii) Dynamic evaluation process. A segmented evaluation system of "mid-year assessment + pre-defense + graduation defense + comprehensive evaluation" is established. (iii) Electronic file folders are utilized to document process data, including scientific research progress, clinical cases, and social practice activities.

4 Conclusions

The development of innovative talents among master's degree students in ethnic medicine constitutes a comprehensive initiative that intricately combines the inheritance and innovation of traditional medicine with contemporary higher education. Central to this endeavor is the cultivation of highly skilled interdisciplinary professionals capable of both preserving the foundational principles of ethnic medicine and spearheading the discipline's modernization. The development of innovative master's degree candidates in Zhuang and Yao medicine represents both a tribute to the millennia-old wisdom of the Zhuang and Yao ethnic groups and a pioneering endeavor in the advancement of future medical practices. This process necessitates achieving a balance between preserving traditional essence and fostering innovation, accomplished through a comprehensive, multidimensional approach encompassing inheritance, innovation, and integration.

Through multi-dimensional reforms encompassing the curriculum system, scientific research training, and evaluation mechanisms, the University's ethnic medical education is progressively transcending the traditional dichotomy between tradition and modernity. It has developed a medical talent cultivation model characterized by Chinese features and the distinctive attributes of the Zhuang and Yao ethnic groups. This model is grounded in the specific needs of Zhuang and Yao regions and aims to cultivate innovative professionals in Zhuang and Yao medicine who are prepared to serve effectively in grassroots units and remain committed to these communities.

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