

Research on Talent Cultivation Models for Vocational Medical Service under the "Healthy China" Initiative

—A Case Study of Clinical Trial-Oriented Student Development

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Abstract: This research takes the cultivation of medical service-oriented talents in higher vocational colleges as its object. It starts with the problems existing at the macro level of "labor shortage in enterprises" and the micro level of "initial establishment of new medical service majors in higher vocational colleges" and "talent cultivation positioning". Through the investigation of the occupational ability and quality requirements of relevant positions in clinical trials, it explores issues such as the cultivation goals, models, and curriculum systems of medical service-oriented talents in higher vocational colleges. It constructs a four-step progressive curriculum system centered on cultivating "students' comprehensive vocational abilities", taking the strengthening of students' professional skills and vocational qualities as the key point, and integrating theory with practice, ideological and political education with professional education, classroom with workplace, and teaching with internships. The system is characterized by "same platform, specialized direction, pre-job training, and on-the-job practice", aiming to cultivate high-quality and highly skilled service-oriented talents with good communication skills and service awareness.

1. Introduction

The Report to the 20th National Congress of the CPC explicitly puts forward the task of "advancing the building of a Healthy China", which promotes the transformation of the national health philosophy from a disease-centered paradigm to a health-centered one. This trend has not only raised new requirements for all types of medical service institutions, but also posed new demands for the cultivation of pharmaceutical service talents.

Meanwhile, the full rollout of the generic drug quality and efficacy consistency evaluation has driven a sharp increase in the demand for clinical trial-related positions, and the talent gap in this field has yet to be effectively bridged to date.

Pharmaceutical service programs in higher vocational colleges serve as one of the critical channels for cultivating a high-caliber contingent of pharmaceutical technical and skilled talents for the country. Nevertheless, due to their relatively late initiation and constraints from factors such as traditional educational concepts and limited faculty strength, these programs are beset with problems including

ambiguous training objectives^[1], unsystematic cultivation frameworks and disconnection from social demands, leaving graduates' professional competencies barely able to match the practical requirements of corresponding posts^[2].

To address these issues, this paper, grounded in the training objectives of pharmaceutical service programs in higher vocational colleges and in line with industry development trends and the requirements of vocational education reform, conducts a systematic exploration into the existing problems in talent cultivation from four dimensions: teaching models, curriculum systems and teaching methodologies, with a view to enhancing the comprehensive quality and professional competence of practitioners in pharmaceutical clinical trial positions.

2. Existing Problems in Pharmaceutical Service Programs in Higher Vocational Colleges

The curriculum system for the clinical trial track of pharmaceutical service programs in higher vocational colleges remains to be further optimized.

Due to the late initiation of program development, vague career orientation and ambiguous training objectives, the current talent cultivation model blindly replicates the academic paradigm of clinical pharmacy programs in undergraduate institutions. Such a model fails to align with the inherent characteristics of higher vocational education—namely, the relatively weak academic foundation of students and the shorter schooling duration—resulting in unsatisfactory teaching effectiveness, inadequate practical application competence among learners, and the failure to fulfill the differentiated training goals of stratified, categorized and post-specific cultivation^[3,4].

Meanwhile, there are prominent deficiencies in digital teaching resources: high-quality online courses, shared cloud-based teaching resource repositories and intelligent virtual simulation experiment platforms are in urgent need of development. The construction of school-enterprise co-built clinical pharmaceutical practice bases lags behind, which can hardly satisfy the demand for in-depth industry-education integration^[5].

3. Construction Contents of the Talent Cultivation System for the Clinical Trial Track of Pharmaceutical Service Programs in Higher Vocational Colleges

3.1 Exploring Post Demands and Clarifying Training Objectives

To achieve the stratified, categorized and post-specific training goals that differentiate higher vocational education from undergraduate clinical pharmacy programs, this study adopts an employment-oriented research approach. Random surveys and analyses of the current state of pharmaceutical services and relevant demands are carried out across multiple stakeholders, including staff of pharmaceutical enterprises, clinicians and patients in hospitals, and community residents in healthcare institutions.

Accordingly, the orientation of vocational posts is clarified, and the requirements for knowledge, professional competence and professional quality for target posts are summarized to draft preliminary talent training objectives. Following review and deliberation by industry experts, the final training objectives for pharmaceutical service talents aligned with the positioning of higher vocational education are ultimately established.

3.2 Optimizing the Cultivation System and Constructing the Talent Cultivation Mode

To cultivate compound pharmaceutical service talents in higher vocational colleges and meet the growing demand for clinical trial professionals, this study establishes the "One Center, Two Grips, Four Integrations, Four Ladders" talent cultivation mode under the guidance of the philosophy of

school-enterprise (school-hospital) dual cooperation and pharmaceutical-medical collaboration.

Centered on enhancing students' comprehensive professional competence (the "One Center") and with the strengthening of professional skills and professional literacy as the two core grips, the mode is implemented via four integration paths: integrating theory with practice, ideological and political education with professional courses, classroom teaching with on-site posts, and school-based teaching with internship practice. It also follows a four-stage progressive practice sequence of "shared platform, specialized orientation, pre-job training, and on-the-job practice". After three years of systematic cultivation, students are expected to develop into highly skilled and compassionate grassroots health guardians.

3.3 Reconstructing Teaching Contents, Building the Curriculum System, and Developing Supporting Online Teaching Resources

Through the joint construction of dual-system practice bases with biopharmaceutical enterprises, this study clarifies the competency requirements of pharmaceutical service post clusters. Tailored to actual post demands, a four-ladder curriculum is developed to progressively cultivate compound talents with expertise in clinical medicine and pharmacy, so as to realize all-round talent cultivation.

The first ladder, "shared platform", adopts general public courses, basic professional courses and core professional courses common to pharmacy programs to foster students' basic pharmaceutical literacy. The second ladder, "specialized orientation", offers directional courses of clinical medicine and clinical pharmacy, upholds pharmaceutical-medical collaboration, and develops students' basic application competence in clinical medicine and pharmacy. The third ladder, "pre-job training", leverages the virtual simulation training platform and introduces post-specific practical courses to enhance students' pharmaceutical service capabilities. The fourth ladder, "on-the-job practice", delivers internship courses for pharmaceutical clinical trial posts based on school-enterprise dual-system practice bases, to cultivate students' comprehensive pharmaceutical service competence. Meanwhile, a continuous chain-shaped practical curriculum integrating "experience, skill training and internship" is established, and the course content for pharmaceutical service professional literacy is reconstructed accordingly.

4. Analysis of Research Results on the Talent Cultivation System

4.1 Conducting Enterprise Surveys to Clarify Talent Training Objectives

The biomedical industry is designated as Suzhou's "No. 1 Industry". Currently, Suzhou is home to over 4,200 biomedical enterprises, with a total industrial scale exceeding 300 billion yuan. To promote the high-quality development of drug clinical trials in this core industry, this study distributed 100 questionnaires to three representative biomedical enterprises (Xinda, Zhaoyan and Tuowei) to investigate the skill and quality requirements, as well as career development prospects, of clinical trial-related positions.

The survey identifies six major categories of clinical trial-related positions: Project Manager (PM), Data Manager (DM), Pharmacovigilance Specialist (PV), Clinical Trial Assistant (CTA), Clinical Research Coordinator (CRC) and Clinical Research Associate (CRA). Among them, the CTA, CRC and CRA positions are compatible with the educational background and skill profiles of students from higher vocational colleges.

4.2 Systematizing Occupational Competency Inventories to Clarify the Training Objectives

This study sorts out and systematizes the occupational competency inventories for the three

positions suitable for higher vocational students, namely Clinical Trial Assistant (CTA), Clinical Research Coordinator (CRC) and Clinical Research Associate (CRA). All these positions require solid professional knowledge, favorable communication and coordination competence, a rigorous work attitude and continuous learning ability, and enable practitioners to gradually improve their occupational competence and career competitiveness through sustained learning and practical experience.

Based on the survey findings, this study clarifies the training objectives of pharmaceutical service talents in higher vocational colleges. On the basis of technical and skilled talent cultivation, the program further focuses on the clinical trial post cluster, aiming to foster high-quality technical service talents with sound communication skills and solid basic theoretical knowledge and skills in clinical medicine and pharmacy, who are competent for positions including Clinical Research Associate (CRA) and Clinical Research Coordinator (CRC). The specific requirements in terms of professional quality, knowledge and competence are detailed in Table 1.

Table 1 Training Requirements for Pharmaceutical Service Talents

Training Specification	Specific Requirements
Professional Quality	1. Possess sound communication competence and verbal expression ability; 2. Maintain a meticulous, patient, rigorous and responsible work attitude; 3. Demonstrate strong stress resistance, execution capability and adaptive coordination competence.
Knowledge	1. Master the basic theories and fundamental skills of clinical medicine and pharmacy; 2. Be familiar with laws, regulations and industrial norms related to clinical trials; 3. Master the core contents and complete procedures of clinical trials; 4. Understand the implication and clinical significance of indicators in subjects' laboratory test reports; 5. Master the application of professional English in clinical pharmacy and related medical fields; 6. Master the storage conditions and methods for pharmaceutical products and test samples.
Competence	1. Assist investigators in formulating clinical protocols in compliance with GCP regulations; 2. Liaise with sponsors before project initiation, receive materials, deliver trial articles and retain contact information; 3. Conduct subject recruitment after project launch, and assist in subject screening, information entry and profile establishment; 4. Accurately perform clinical data entry and management in CRF and EDC systems to guarantee data accuracy; 5. Regulate trial progress, coordinate subjects' visit schedules, and implement full-process subject management; 6. Coordinate with staff in research centers and maintain sound cooperative relations with investigators; 7. Complete monitoring work, submit reports and feedback issues in accordance with monitoring plans and SOPs, so as to ensure trial quality; 8. Cooperate with QA managers in audit work and promptly rectify existing problems.

4.3 Implementing Stratified and Categorized Cultivation and Constructing the Talent Cultivation Mode

This study reforms the original cultivation system of the pharmaceutical biotechnology program cluster in higher vocational colleges. Centered on fostering students' comprehensive professional competence, it categorizes talents into three types in alignment with industrial demands: technical-skilled, technical-innovative and technical-service-oriented, among which pharmaceutical service talents fall under the technical-service-oriented category. With the strengthening of professional skills

and professional literacy as the two core grips, the mode realizes the organic integration of theory and practice, classroom teaching and on-site posts, school-based teaching and internship practice, and ideological-political education and professional courses respectively, by building a virtual simulation practice platform, constructing school-enterprise dual practice bases, promoting pre-job training and enterprise practice, and exploring ideological and political elements embedded in courses.

The cultivation path progresses in four ladders: In the first academic year, students of all three categories take shared technical-skilled courses to complete the "shared platform" cultivation. In the second academic year, stratified selection is conducted, and directional courses such as *Concise Medical Fundamentals*, *Pharmaceutical Clinical Trials* and *GCP Regulations* are offered to implement "specialized orientation" cultivation. In the third academic year, continuous practical courses including CRC pre-job training, pharmaceutical service skill training and fixed-post internship are carried out to deliver the "pre-job training" and "on-the-job practice" phases.

4.4 Building the Curriculum System for Pharmaceutical Service Programs and Developing Online Digital Resources

The curriculum system consists of four modules: platform foundation, professional platform, post core and post practice, which correspond to the four-ladder cultivation paths of "shared platform, specialized orientation, pre-job training and on-the-job practice" respectively. Platform foundation courses are jointly defined by schools and enterprises, covering the general knowledge and skills essential for target posts. Professional platform courses are grounded in post competency requirements to consolidate students' professional foundation. Post core courses focus on the core tasks of enterprise post clusters and are co-developed through in-depth school-enterprise collaboration. Post practice courses, relying on school-enterprise dual bases, carry out clinical post internships to temper students' comprehensive service competence. Oriented by occupational competence, the four modules form a four-ladder progressive curriculum system with step-by-step competence enhancement.

Courses are designed under the framework of public basic courses, professional platform courses, professional core courses, professional elective courses and practical training links, with the specific arrangement presented in Table 2.

Table 2 Curriculum Structure for Pharmaceutical Service Talent Cultivation

Module Category	Category	Courses	Academic Year	Eligible Students
Platform Foundation Course Module	Public Compulsory Courses	Morality and Rule of Law, Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, Situation and Policy, Career Development and Employment Guidance for College Students, Mental Health, Military Theory, Military Skills, Entrepreneurship Education, Physical Education, Information Technology, General Workplace English, Cultivation of Pharmaceutical Professional Literacy	First Academic Year	Students of the Pharmaceutical Biotechnology Program Cluster
Professional Platform Course Module	Professional Platform Courses	Laboratory Safety, Basic Chemistry, Basic Chemistry Experiment, Biochemistry, Molecular Biology, Pharmaceutical Quality and Testing		

Post Core Course Module	Professional Core Courses	Communication Skills, Concise Medical Fundamentals, Pharmaceutical Clinical Trials, GCP Regulations, Basics of Pharmacology, Cell Biology	Second Academic Year	Pharmaceutical Service Program Students (stratified and categorized cultivation initiated)
	Professional Elective Courses	Professional English, Application of Biostatistics Software, Pharmaceutical Affairs Administration, Eloquence and Speech		
Post Practice Course Module	Practical Training Links	Cognitive Internship, CRC Comprehensive Training, Labor Education and Labor Week, CRC On-the-job Internship, Fixed-post Internship, Internship Report	Third Academic Year	

Construction of a General Knowledge & Skill Repository and Development of Structured New-Form Textbooks. A general knowledge and skill repository is built to develop structured new-form textbooks. On the basis of the data resource repository supporting loose-leaf textbooks, this study breaks through the limitation of the "one-to-one" correspondence between textbooks and courses. Knowledge from professional platform courses is fragmented and systematically reorganized across multiple dimensions including professional fields, difficulty levels and application scenarios. Meanwhile, knowledge points and skill points are refined to improve the precision and diversity of textbook services.

An innovative teaching evaluation system based on digital textbooks is established. By collecting and analyzing data on students' online browsing, interaction and assessment, comprehensive intelligent evaluation is conducted to identify weak links in competence, providing support for personalized teaching and learning improvement. Meanwhile, intelligent agents for virtual simulation training projects and textbook intelligent agents are developed. Supported by VR, AR and artificial intelligence technologies, an immersive training environment is created to realize real-time monitoring of students' operation processes, recording of execution details, and analysis of operation accuracy and efficiency. Intelligent evaluation is carried out with personalized learning suggestions and resources delivered accordingly, so as to enhance teaching effectiveness and students' skill proficiency.

5. Conclusion

On the basis of a systematic review of existing relevant policies and empirical surveys on the talent demands of pharmaceutical enterprises, this study advances the reform of the pharmaceutical service talent cultivation mode. By clarifying talent training objectives, formulating talent cultivation schemes, establishing a systematic curriculum system, compiling supporting textbooks and developing online teaching resources, it has constructed the "One Center, Two Grips, Four Integrations, Four Ladders" talent cultivation system, and initially established a targeted talent cultivation mode for the clinical trial track of pharmaceutical service programs in higher vocational colleges against the backdrop of the Healthy China Initiative.

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References

- [1] Yu S. Research on School-running Orientation and High-quality Development Strategy of Medical and Health Higher Vocational Colleges[J]. *Journal of Southern Vocational Education*, 2021, 11(2): 23-28.
- [2] Zhang C. Current Situation and Strategies of Health Service Talent Cultivation in Five-year Higher Vocational Education from the Perspective of Medical-Education Collaboration: A Survey of 7 Five-year Medical and Health Vocational Schools in Jiangsu Province[J]. *Education Horizon*, 2023, (15): 16-21.
- [3] Wang Y. Analysis on Orientation Differences Between Private Undergraduate Colleges and Higher Vocational Colleges from the Perspective of Applied Talent Cultivation[J]. *Higher Education Forum*, 2020, (1): 63-67.
- [4] Dong X, Chen X. A Comparative Study on Training Modes and Orientations of Vocational Undergraduate Education, Higher Vocational Education and General Undergraduate Education and Corresponding Cultivation Principles[J]. *Modern Vocational Education*, 2022, (36): 28-31.
- [5] Wang D. Dilemma and Teaching Reform Direction of Talent Cultivation in Medical Higher Vocational Colleges Under the Background of the "Double High Plan"[J]. *China Medicine and Pharmacy*, 2022, 12(9): 82-86.