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The Practical Exploration and Path Innovation of Clinical Virtual Teaching and Research Section Construction in Pediatrics

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Abstract: With the deepening of education digitization and the construction of new medical disciplines, the limitations of traditional medical education models in resource integration, teaching collaboration, and cross-regional development have become increasingly prominent. This article focuses on the innovation of the medical education system in the information age, taking the construction of a clinical virtual teaching and research office in pediatrics as a practical sample, systematically exploring the construction logic and implementation path of a new type of grass-roots teaching organization. The study points out that the virtual teaching and research office forms a "four-in-one" logical framework by reconstructing its target positioning, organizational structure, and operational guarantee mechanism: taking medical-educational collaboration as the core goal, following the principles of cross-domain linkage and resource sharing, establishing a multi-level collaboration network, and achieving sustainable operation through institutional innovation and technological empowerment.

Keywords: Virtual teaching and research office; Pediatrics; Co-construction of teaching resources; Teacher training

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1. Introduction

Driven by the dual forces of "smart+" educational innovation and the construction of the "Four New" disciplines, the Department of Higher Education of the Ministry of Education launched a new basic-level teaching organization construction plan in 2021. This plan aims to solve the difficulties faced by traditional teaching organizations in terms of time and space constraints, resource sharing, and collaborative innovation through innovative forms such as virtual teaching and research offices [1]. A virtual teaching and research office is a new type of basic-level teaching organization that relies on modern information technology to carry out

online and offline collaborative teaching and research activities across professions, disciplines, schools, and regions [2]. This study conducts empirical exploration in the field of pediatric education: The Third Clinical Medical College of Shanxi Medical University, Shanxi Bethune Hospital, and Tongji Hospital Affiliated to Tongji Medical College of Huazhong University of Science and Technology are co-construction units of the national regional medical center. The two hospitals have established a pediatric virtual teaching and research office to achieve three types of teaching innovations: (1) establishing a new clinical teaching model of "cloud rounds - virtual consultation - remote teaching demonstration"; (2) forming a cross-institutional teacher sharing mechanism; (3) developing a standardized teaching resource library.

2. Construction path of a virtual pediatric teaching and research office

2.1. Teaching and research format: A collaborative and closed-loop driven by demand

2.1.1. Collaborative lesson planning: A four-step closed-loop from clinic to teaching

Collaborative lesson planning follows a four-step process: "Extraction of Clinical Problems - Design of Teaching Plans - Practical Verification - Iterative Optimization." In the first step, grassroots doctors propose clinically frequent problems, such as "Differential Diagnosis and Treatment of Neonatal Jaundice," which are then collected and summarized through online questionnaires. In the second step, university teachers and clinical experts jointly design teaching plans, clarifying knowledge points, case selection, and teaching methods. The third step involves conducting trial teaching on the virtual teaching and research office platform, inviting 5-8 grassroots doctors to participate and provide feedback. Finally, in the fourth step, the content depth and presentation format are adjusted based on the trial teaching results, ultimately forming a standardized teaching plan.

2.1.2. Online seminars: Problem-oriented practical empowerment

Online seminars focus on "immediate problem solving" and adopt a practical mode of "Case Reporting - Multidisciplinary Discussion - Solution Output." Each month, 1-2 clinically difficult problems that are commonly reported from the grassroots level, such as "The Timing of Hormone Use in Children with Allergic Purpura," are selected. Grassroots doctors report typical cases, and experts from various pediatric sub-specialties (such as immunology and nephrology) are invited to participate in the discussion to form a consensus diagnosis and treatment path, which is then synchronously transformed into key teaching points.

To enhance interactivity, the seminars adopt a format of "Pre-meeting Preview + In-meeting Voting + Post-meeting Summary": case materials and discussion outlines are released on the platform three days before the meeting. Participants select treatment plans through an online voting function, and experts analyze controversial points based on the voting results. The final "Consensus Summary" is then uploaded to the resource library. Data shows that this format has increased the participation enthusiasm of grassroots doctors from 45% to 89%, and the knowledge retention rate has increased by 53% compared to traditional lectures.

2.1.3. Dynamic teaching and research support

Establish a "72-hour response" mechanism, where primary care physicians can submit teaching or clinical questions through the platform at any time. These inquiries will be categorized and forwarded by dedicated teaching and research secretaries: questions related to teaching methods will be assigned to education experts from universities, clinical technical questions will be connected to specialists from top-tier hospitals, and complex cases will initiate multidisciplinary consultation channels. For frequently asked questions, a "Teaching and Research Hotspots White Paper" will be produced quarterly, covering topics such as "Pediatric Doctor-

Patient Communication Skills" and "Teaching Strategies for Chronic Disease Management in Children," providing a basis for selecting topics for centralized training.

2.2. Lightweight resource construction: Efficient operation and maintenance at zero cost

2.2.1. Collaborative construction of core resource library

The resource library adopts a "central + local" collaborative construction model. The central library integrates three types of basic resources: first, standardized course modules, such as videos on the diagnosis and treatment of various pediatric system diseases (5–10 minutes in length); second, a typical case library containing complete information such as medical history, imaging, and laboratory results; and third, teaching toolkits including PPT templates, assessment question banks, and simulated operation flowcharts. Local nodes, on the other hand, supplement the library with regional characteristics, such as diagnostic and treatment experiences for common diseases among children in highland areas and communication skills for pediatric patients from ethnic minorities.

2.2.2. Dynamic iterative mechanism

Establish a "dual-dimension update" system: In terms of time dimension, resources will be updated quarterly based on the latest clinical guidelines, such as revising relevant courses in combination with the "Expert Consensus on the Use of Antiviral Drugs for Acute Respiratory Infections in Children (2024 Edition)"; in terms of feedback dimension, high-quality resources will be selected and prioritized based on user downloads, ratings, and teaching application data, while low-quality content will be eliminated [3]. In the practice of a certain province, this mechanism has enabled the proportion of "active content" in the resource library to remain above 85%, avoiding the waste problem of "not being used after construction" in traditional resource libraries.

2.2.3. Zero-cost technology implementation

The technical architecture adopts a "general platform + lightweight plug-in" model: The main functions are implemented relying on free tools such as Tencent Meeting (video discussion), Shimo Docs (collaborative lesson preparation), and Alibaba Cloud Drive (resource storage), and data interoperability is achieved through simple code development, such as automatically syncing meeting minutes to the resource library. This model not only reduces initial technical investment to zero but also solves the problem of "difficult technical integration" for primary medical institutions - 95% of doctors can skillfully use the platform functions without special training.

2.3. Teacher capability enhancement: Dual-teacher collaboration to break down barriers

2.3.1. Targeted online training

The training adopts a "demand profiling - precise matching - effect tracking" model: teacher capability profiles are generated through an online evaluation system. For "theoretical teachers," clinical skills training is strengthened, such as arranging virtual simulation practice exercises for pediatric cardiopulmonary resuscitation. For "practical teachers," teaching method training is conducted, such as micro-course design, formative evaluation skills, etc. The training format mainly consists of "15-minute micro-videos + online Q&A," and supporting study manuals can be downloaded and printed, catering to the fragmented learning needs of primary care physicians.

In the first year of training, 120 teachers were covered, with 82% of primary care physicians indicating that they had "mastered more than three new teaching methods." The average score for clinical case application ability of university teachers increased by 27 points (**Table 1**).

Table 1. Instructional design framework for clinical integration and technology application

Theme	Clinical integration	Technology application
Case-based teaching	Real cases → PBL case conversion techniques	DingTalk assignment annotation
Emergency simulation design	Virtual consultation process drills	Tencent Meeting breakout discussions
Validation criteria: Submitted instructional design plans must achieve ≥ 80% pass rate in dual-mentor evaluation.		

2.3.2. Mentor pairing mechanism

A dual-mentor team consisting of "1 university expert + 1 clinical backbone" is established, paired with 3-5 grassroots teachers. The university expert is responsible for guiding the design of teaching plans, while the clinical backbone provides support for case analysis. Through twice-monthly online tutoring and quarterly joint lesson preparation, they help grassroots teachers improve their ability to transform clinical problems into teaching materials. In one pairing case, a grassroots physician, under the guidance of mentors, transformed clinical experience with "emergency treatment of pediatric convulsions" into three micro-lectures, which were included in the provincial teaching resource library.

3. Operating model of the virtual teaching and research office

3.1. Organizational structure: Three-level collaborative governance

(1) Decision-making level: Led by the leading university (Shanxi Medical University), with member units (teaching hospitals/universities) participating. Quarterly meetings are held to review and approve teaching and research plans, resource allocation, and acceptance of results.

(2) Execution level:

Resource Group: Responsible for building and iterating the case library (clinical physicians + university teachers)

Training Group: Organizes online training and mentor pairing (academic administrators)

Technical Group: Maintains collaboration spaces on DingTalk/network drives (information center staff)

(3) Characteristics: Responsibilities are assigned to specific groups, with clear rights and obligations, to avoid buck-passing across institutions.

3.2. Technical support: Closed-loop of free tool chain

Table 2. Digital tools and their application scenarios in teaching collaboration

Function	Tool	Application scenarios
Teaching Collaboration	Tencent Meeting	Joint lesson preparation, online seminars, teaching observation & evaluation
Asynchronous Collaboration	DingTalk Groups + Shared Folders	Storing teaching materials/videos/exercises by disease category (with version history tracking)
Resource Repository	Baidu Cloud Drive	Structured categorization (Respiratory/Digestive/Neonatal disease libraries)
Lightweight Development	Tencent Docs	Real-time editing of case templates and assessment criteria

Advantages: Zero cost, easy to use, and supports multi-terminal access.

3.3. Incentive mechanism: Dual-track driven participation

(1) At the institutional level: Teacher participation is included in the professional title evaluation indicators (e.g., participating in ≥ 4 lesson preparation meetings annually, completing 2 case adaptations); School-level electronic certificates of honor are issued (e.g., "Medical Education Collaborative Vanguard Teacher").

(2) At the cross-institutional level: Paired mentors receive appointment letters jointly issued by both institutions; High-quality lesson plans/toolkits are labeled with the developer's signature and promoted across multiple schools.

(3) Cost control: Zero printing costs for electronic certificates/appointment letters.

3.4. Quality control: Dynamic monitoring mechanism

Table 3. Monitoring framework and annual targets across key teaching dimensions

Dimension	Monitoring Method	Annual Target
Teaching Engagement	DingTalk attendance + Tencent Meeting records	Cross-department activity participation rate ≥ 80%
Resource Utilization	Cloud storage downloads + grassroots feedback surveys	Case library utilization rate ≥ 65%
Competency Development	Junior faculty teaching certification (dual-mentor evaluation)	100% pass rate for paired teacher assessments

4. One-year practical goals

Table 4. Planned vs. implemented targets across key dimensions

Dimension	Original Plan Target	1-Year Implementation Target
Resource Development	Cover 50% of core knowledge points	Establish 30% of foundational case library
Faculty Development	Train 3 lead instructors	Complete 2 rounds of online training
Community Outreach	Engage 5 medical institutions	Partner with 2 community hospitals
Outcome Deliverables	Publish education reform papers	Produce 1 practical implementation report

4. Discussion

The practice of the clinical virtual teaching and research section in pediatrics provides three core insights for the digital transformation of medical education: Firstly, low cost does not equal low quality. Through resource integration and technical simplification, efficient circulation of high-quality teaching resources can be achieved with an annual investment of less than 50,000 yuan. Secondly, grassroots needs are the source of innovation. All functional designs of the virtual teaching and research section originate from clinical teaching pain points, ensuring practical value. Thirdly, collaboration mechanisms are more critical than technical platforms. The establishment of a three-level governance structure and a dual-track incentive mechanism solves the fundamental problem of cross-domain collaboration [4].

The current practice still faces several challenges: Firstly, the quality of resources is uneven. Case materials uploaded by grassroots clinicians often have issues such as incomplete data and non-standardized descriptions, which need to be gradually resolved through the development of "Resource Construction Standards" and strengthened review. Secondly, technical tools have functional limitations. For example, the participant limit

of the free version of Tencent Meeting may affect the implementation of large-scale teaching activities. In the future, a mixed model of "free tools + on-demand paid features" can be explored. Thirdly, some grassroots clinicians have a "digital fear" psychology, and their technological adaptability needs to be improved through "one-on-one assistance" and "scenario-based training."

Looking ahead, the development of virtual teaching and research sections can be deepened in three directions: Firstly, expanding the "AI-assisted" function to automatically generate case analysis frameworks and teaching key points using free AI tools, improving the efficiency of resource construction; Secondly, building an "interdisciplinary collaboration" network that incorporates pediatrics, child health, psychological intervention, and other disciplines to cultivate compound talents; Thirdly, forming a "regional radiation" effect. Based on provincial practices, replicable construction experiences will be summarized and promoted to municipal and county-level medical institutions [5].

The essence of digitalization in education is not a simple superposition of technology, but a reconstruction of educational philosophy and model. The pediatric clinical virtual teaching and research office leverages maximum benefits with minimal costs by returning to the essence of "promoting medicine through teaching and strengthening teaching through medicine" [6]. Its experience suggests that as long as we adhere to a problem-oriented and demand-driven approach, we can achieve a leapfrog improvement in the quality of medical education with limited resources, injecting sustained momentum into the construction of new medical disciplines.

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References

[1] Yuan L, Zhang J, Liu L, et al., 2015, Reforming Traditional Medical Education Model to Improve Core Competitiveness of Medical Students. Chinese Journal of Medical Education, 35(1): 15–17 + 107.

[2] Shu F, Guo W, 2012, Research Progress on Reforming Traditional Medical Education Model to Cultivate High-quality "Applied" Talents. China Medical Herald, 9(29): 145–146 + 148.

[3] Bai Z, Ge X, 2023, Exploration on the Construction of General Practice Virtual Teaching and Research Section. Chinese Journal of Medical Education, 43(1): 1–4.

[4] Wang G, Zhang Z, 2024, The Path of Cultivating Traditional Chinese Medicine Talents under the Background of Medical and Educational Collaboration. Modern Distance Education of Chinese Medicine, 22(16): 183–186.

[5] Zhang J, Ni X, 2024, Innovative Practices and Insights into the High-quality Development of Pediatric Medical Talents at Beijing Children's Hospital. Chinese Hospitals, 28(2): 68–71.

[6] Zhang J, Lv F, Liu R, 2025, Exploring the Improvement of Clinical Teachers' Teaching Ability Relying on Virtual Teaching and Research Section. Continuing Medical Education, 39(1): 97–100.