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Transforming Clinical Skills Teaching with a Flipped Classroom and Problem-Based Learning Hybrid Approach

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Abstract: The enhancement of clinical skills teaching quality is pivotal for cultivating competent medical professionals. Confronting the limitations of traditional lecture-based methods in fostering student initiative and clinical reasoning, this study proposes and explores a novel multidimensional interaction model that integrates the Flipped Classroom (FC) and Problem-Based Learning (PBL) approaches. The model is structured around three core phases: pre-class knowledge acquisition via digital platforms, in-class PBL sessions for knowledge internalization and clinical application, and post-class reflection and consolidation. This framework facilitates a fundamental shift in educational roles, positioning the teacher as a guide and the student as an active learner. Preliminary application within a clinical skills course demonstrates that the model effectively stimulates student engagement, improves autonomous learning capabilities, strengthens teamwork and communication skills, and deepens the integration of professional values and ethical practice. This FC-PBL integrated model presents a viable and effective pathway for innovating clinical skills training in medical education.

Keywords: Flipped Classroom; Problem-Based Learning; Clinical Skills; Teaching Reform; Medical Education; Interactive Learning

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1.Introduction

Clinical skills training represents a crucial bridge between theoretical knowledge and practical application, serving as the cornerstone for producing clinically competent medical graduates [1]. In China, the ongoing expansion of higher education necessitates a heightened focus on teaching quality, demanding a shift from passive, teacher-centered instruction to more engaging and effective pedagogical models [2]. The traditional “cramming” method often relegates students to a passive role, which can stifle the development of critical thinking, innovation, and practical problem-solving abilities essential for modern healthcare [3].

In this context, the integration of innovative educational strategies offers significant promise. The Flipped Classroom (FC) model, which leverages digital resources to transfer initial knowledge acquisition outside the classroom, frees up valuable in-class time for active learning [4]. Concurrently, Problem-Based Learning (PBL), a well-established student-centered pedagogy, uses real-world clinical problems as a stimulus for learning, effectively promoting self-directed study, clinical reasoning, and collaborative skills [5]. While both FC and PBL have demonstrated individual merits, their integration is theoretically synergistic. FC provides the foundational knowledge framework, while PBL offers a dynamic environment for its application, thereby effectively narrowing the theory-practice gap [6, 7]. This study, grounded in the teaching practices of the “Clinical

Basic Skills of Traditional Chinese and Western Medicine" course, constructs a multidimensional interaction model that systematically integrates FC and PBL, and investigates its implementation pathway and impact on clinical skills teaching quality.

2.The Theoretical Rationale and Value of the FC-PBL Integrated Model

2.1 Facilitating a Pedagogical Shift to Empower Learners

The integrated model fundamentally redefines the roles of instructors and students. In the pre-class phase, students transition from passive recipients to active constructors of knowledge by engaging with curated digital learning materials [8]. During class, instructors shed their traditional role as sole knowledge authorities and become facilitators of learning, guiding PBL discussions and clinical simulations. This shift empowers students, placing them at the center of the learning process and fully mobilizing their subjective initiative [9].

2.2 Promoting Deep Learning and Clinical Competence

The model creates a continuous learning cycle that promotes deep knowledge internalization. The FC component ensures students acquire essential knowledge independently, while the in-class PBL sessions challenge them to apply, analyze, and synthesize this knowledge in solving complex, authentic clinical problems [10]. This progression from knowledge acquisition to application effectively bridges the gap between abstract theory and clinical practice, thereby enhancing students' clinical problem-solving capabilities [11].

2.3 Embedding Professional Values and Ethical Formation

The model provides a robust framework for seamlessly integrating "Curriculum Ideology and Politics." By systematically embedding elements of medical ethics, humanitarian spirit, and professional responsibility into clinical cases and discussions, the model fosters the development of virtuous, well-rounded medical professionals [12]. Cultivating a spirit of collaboration, empathy, and dedication within the PBL team environment aligns with the overarching goal of fostering virtue through education [13].

3.Construction and Implementation of the FC-PBL Multidimensional Interaction Model

The proposed model operationalizes the integration of FC and PBL through a structured, three-phase implementation pathway.

3.1 Pre-class Phase: Platform Construction and Preparatory Work

3.1.1 Resource Integration and Digital Platform Development

A robust and user-friendly online teaching platform is the foundational infrastructure for the FC model [14]. Building upon existing course resources, we developed a comprehensive digital repository featuring micro-lectures, supplementary readings, clinical case vignettes ("micro-cases"), and self-assessment quizzes. This platform also incorporates interactive features such as discussion forums and online Q&A to support collaborative pre-class learning and timely feedback [8].

3.1.2 Faculty Development and Readiness

Successful implementation requires teachers to be proficient in both FC and PBL methodologies. Targeted training workshops were conducted to equip faculty with the skills needed for creating high-quality digital content, designing compelling PBL cases, and effectively facilitating student-centered discussions. This preparation is critical for ensuring a smooth transition from traditional instruction [15].

3.2 In-class Phase: Clinical Application and Value Guidance

3.2.1 Problem-Based Learning and Clinical Simulation

Classroom time is primarily dedicated to active, collaborative learning through PBL. Faculty present students with carefully designed, realistic clinical scenarios. Working in small groups, students engage in case analysis, differential diagnosis, and development of management plans. This process rigorously exercises their clinical reasoning, communication, and teamwork skills [16]. For instance, a simulated "acute abdominal pain" consultation allows students to practice history-taking, physical examination maneuvers, and interprofessional collaboration.

3.2.2 Integration of Ideological and Political Education

The PBL process naturally incorporates professional value cultivation. Discussions around patient confidentiality, informed consent, and ethical dilemmas in clinical care are guided by the instructor. This integrates the development of technical skills with the formation of a strong professional ethical foundation, emphasizing the duty of care and compassion [17].

3.3 Post-class Phase: Consolidation and Continuous Improvement

3.3.1 Reinforcement and Personalized Feedback

Following the in-class session, instructors provide structured feedback on both individual and group performance, highlighting strengths and identifying areas for improvement. Key learning points, exemplary group solutions, and additional resources are consolidated and shared on the online platform to aid in knowledge reinforcement and self-directed review [18].

3.3.2 Reflective Practice and Curriculum Optimization

The model establishes a feedback loop for continuous quality enhancement. Instructors analyze data from platform analytics, student performance on assessments, and collected feedback to identify challenges and successes. This reflective practice informs subsequent iterations of course design, PBL cases, and instructional strategies, leading to sustained improvement in teaching effectiveness [19].

4.Practical Challenges and Strategic Countermeasures

The implementation of this innovative model is not without its challenges, which require proactive strategies.

4.1 Faculty-Related Challenges: Capacity Building and Workload Management

The model demands higher levels of digital literacy, case design expertise, and facilitation skills from teachers, which can be a barrier for some [20]. Furthermore, the initial development of digital resources and the ongoing facilitation of PBL sessions can increase faculty workload [21].

Countermeasures: Institutions should invest in sustained, practical faculty development programs and foster communities of practice for sharing resources and experiences. Furthermore, formal recognition of teaching innovation in promotion and performance appraisal systems is essential to incentivize faculty engagement.

4.2 Student-Related Challenges: Readiness and Adaptation

Students may exhibit varying levels of self-discipline and digital competency, leading to uneven pre-class preparation. Some may initially struggle with the active learning demands of PBL after years of passive learning [22].

Countermeasures: Clear guidelines and scaffolding for autonomous learning should be provided. Tiered task design can cater to diverse student abilities. Early and transparent communication about the rationale and expectations of the new model is crucial to foster student buy-in and a smooth transition.

5.Conclusion and Future Directions

The FC-PBL integrated multidimensional interaction model represents a significant shift towards a student-centered, competency-based paradigm in clinical skills education. By systematically restructuring the learning process across pre-class, in-class, and post-class phases, it effectively promotes deep learning, clinical competency, and professional identity formation. Initial implementation suggests its potential to enhance student engagement, autonomous learning capacity, and collaborative skills.

Future work will focus on the long-term evaluation of the model's impact, including tracking graduates' clinical performance. Further development of the digital platform, particularly incorporating learning analytics and AI-assisted personalized feedback, is also a key direction. This model offers a valuable reference for ongoing reform and innovation in medical and health professions education.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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