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Construction and Application of a Flipped Classroom Model in Experimental Courses of *Fundamentals of Nursing* Based on University - Hospital Collaboration: A Case Study of Aseptic Technique

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Abstract: ***Objective:*** ***This study aimed to construct and validate a flipped classroom model (FCM) for experimental courses in Fundamentals of Nursing (FCM-FNPC) under university-hospital collaboration and evaluate its effectiveness using aseptic technique as an example. Through literature review, expert panel discussions, and three rounds of teaching seminars, a closed-loop teaching model was developed, comprising pre-class resources, in-class interactive activities, and post-class consolidation.*** ***Methods:*** ***A non-synchronous controlled trial was conducted, involving 2020-grade nursing undergraduates (control group, n=60) and 2021-grade students (experimental group, n=62) from Youjiang Medical University for Nationalities.*** ***Results:*** ***The control group received traditional instruction, while the experimental group adopted FCM-FNPC.*** ***Results:*** ***showed that the experimental group outperformed the control group in operational skills (89.5±4.2 vs. 82.1±5.6, P<0.01) and overall scores (85.3±3.8 vs. 78.9±4.5, P<0.05). Significant improvements were observed in collaborative skills (4.2±0.6 vs. 3.5±0.7) and information literacy (4.0±0.5 vs. 3.3±0.6) (P<0.05). Qualitative interviews revealed that students deepened their skill mastery through pre-class videos and in-class collaboration, while teachers reported enhanced teaching efficiency.*** ***Conclusion:*** ***This study confirms that FCM-FNPC effectively improves nursing experimental education and offers an innovative approach for skill-based courses like aseptic technique.***

Keywords: Flipped classroom, Nursing education, Experimental teaching, Aseptic technique, University-hospital collaboration**.**

1. Introduction

Nursing is a highly practical discipline, with experimental teaching serving as the cornerstone for cultivating clinical skills among students [1]. However, traditional experimental instruction often faces challenges such as time constraints, passive imitation of teacher demonstrations, insufficient individualized guidance, and limited integration of clinical cases [2]. The flipped classroom model (FCM), which shifts knowledge acquisition to pre-class activities and focuses on skill internalization and problem-solving during class, has demonstrated significant advantages in medical education [3]. This study leverages university-hospital collaboration to develop an FCM tailored for nursing experimental courses (FCM-FNPC) [4], using aseptic technique as a case study to explore its efficacy in enhancing operational competence, self-directed learning, and course satisfaction, thereby providing empirical evidence for nursing education reform [5].

2. Methods

2.1 Participants

The study included 2020-grade (control group, n=60) and 2021-grade (experimental group, n=62) nursing undergraduates from Youjiang Medical University for Nationalities. Both cohorts were in their second academic year, following identical syllabi and teaching schedules.

2.2 Study Design

A non-synchronous controlled trial was conducted. The control group received traditional instruction, while the experimental group adopted FCM-FNPC.

Control Group (Traditional Teaching):

Pre-class: Students independently preview relevant learning materials.

In-class: Teacher demonstrations followed by student imitation, peer evaluations, and feedback.

Post-class: Independent video review and practice.

Experimental Group (FCM-FNPC):

Pre-class: Access to instructional videos and documents via an online platform; completion of pre-class assignments and lab practice reservations.

In-class: Group discussions, randomized student demonstrations, peer critiques, targeted teacher guidance, and collaborative practice.

Post-class: Video review and practice via the platform, supplemented by clinical teacher feedback.

2.3 Instruments

Demographic Questionnaire: Collected gender, academic background, and prior academic performance.

Course Experience Questionnaire: 31 closed-ended and 3 open-ended items across six dimensions: teaching, assessment, practical activities, academic support, professional competence, and personal development [6].

Self-Directed Learning Ability Scale: 30 items covering motivation, self-management, collaboration, and information literacy [7].

Course Scores: Calculated as 60% theory, 30% operational skills, and 10% attendance/participation.

2.4 Statistical Analysis

Data were analyzed using SPSS 25.0. Continuous variables were described as mean ± SD and compared via independent or paired t-tests; categorical variables were analyzed using χ^2 tests. P<0.05 indicated statistical significance.

3. Results

3.1 Course Performance

The experimental group showed significantly higher operational scores (89.5±4.2 vs. 82.1±5.6, P<0.01) and total scores (85.3±3.8 vs. 78.9±4.5, P<0.05) compared to the control group. No significant differences were observed in theory or attendance scores (P>0.05) (Table 1).

Table 1: Comparison of Course Performance (Mean ± SD)

Assessment	Experimental Group (n=62)	Control Group (n=60)	*t*-value	*P*-value
Theory	80.2 ± 5.1	78.5 ± 4.9	1.42	0.159
Operational	89.5 ± 4.2	82.1 ± 5.6	6.83	<0.01**
Attendance	90.1 ± 3.5	88.7 ± 4.0	1.67	0.098
Total	85.3 ± 3.8	78.9 ± 4.5	7.12	<0.05*

3.2 Self-Directed Learning Abilities

The experimental group demonstrated superior collaborative skills (4.2±0.6 vs. 3.5±0.7, P<0.01) and information literacy (4.0±0.5 vs. 3.3±0.6, P<0.05) (Table 2).

Table 2: Self-Directed Learning Abilities (Mean ± SD)

Dimension	Experimental Group (n=62)	Control Group (n=60)	*U*-value	*P*-value
Collaboration	4.2 ± 0.6	3.5 ± 0.7	205	<0.01**
Information	4.0 ± 0.5	3.3 ± 0.6	245	<0.05*

3.3 Course Experience

The experimental group reported higher satisfaction in practical activities (4.5±0.4 vs. 3.8±0.5, P<0.01) and professional competence (4.3±0.3 vs. 3.9±0.4, P<0.01) (Table 3).

Table 3: Course Experience Ratings (Mean ± SD)

Dimension	Experimental Group	Control Group	*P*-value
Practical	4.5 ± 0.4	3.8 ± 0.5	<0.01**
Professional	4.3 ± 0.3	3.9 ± 0.4	<0.01**

4. Discussion

4.1 Effectiveness of FCM-FNPC

The significant improvement in operational skills (P<0.01) highlights the advantages of FCM in procedural learning. Pre-class videos (e.g., demonstrating aseptic instrument transfer) allowed repetitive viewing and self-practice, reinforcing muscle memory [8]. In-class peer discussions and immediate feedback further consolidated learning.

4.2 Role of University-Hospital Collaboration

Clinical teachers enriched the curriculum with real-world scenarios (e.g., postoperative infection control), enhancing the relevance of aseptic technique. However, sustained resource development requires institutional synergy. A "clinical-academic dual mentorship" system is recommended to optimize collaboration [9].

5. Conclusion

The FCM-FNPC model significantly enhanced nursing students' aseptic technique proficiency and self-directed learning abilities. University-hospital collaboration was pivotal in integrating clinical resources. Future studies should refine resource development mechanisms and explore FCM applications in broader nursing skill curricula [10].

Conflict of Interest

The authors have no conflicts of interest to declare.

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References

[1] Zeng, K., Meiheriban·Aihemaiti, Zeng, L., et al. (2021). *Empirical Study of Flipped Classroom in Theoretical Teaching of Fundamentals of Nursing*. General Nursing, 19(24), 3450–3453.

[2] Zhang, Q., Song, Y., Zhou, L., et al. (2024). *Application of Micro-lectures and Flipped Classroom in Nursing Internship Teaching in Neurology*. China Continuing Medical Education, 16(24), 25–29.

[3] Shi, Y., Huang, Q., Guan, C., et al. (2024). *Evaluation of Mind Mapping Combined with Flipped Classroom in Fundamentals of Nursing for Vocational Education*. Shaanxi Open University Journal, 26(3), 81–86.

[4] Li, X., Lin, J., Huang, H., et al. (2019). *Application of CBE Teaching Model in Nursing Skill Training*. Health Vocational Education, 37(2), 96–98.

[5] Ji, B., Jiang, X., Ren, J., et al. (2024). *Project-Based Team Learning Combined with Flipped Classroom in Nursing Research Education*. Journal of Nursing Science, 39(15), 65–68.

[6] Chen, L. (2020). *Construction and Application of Flipped Classroom in Experimental Courses of*

*Fundamentals of Nursing**. [Master's Thesis]. Fujian Medical University.

[7] Zhang, X., & Li, X. (2010). *Theoretical Analysis of Self-Directed Learning Abilities in Nursing Students*. Journal of Shenyang Medical College, 12(3), 185–186.

[8] Li, W., Ma, J., Wang, Y., et al. (2024). *Application of Rain Classroom-Based Flipped Teaching in Fundamentals of Nursing Practical Training*. Health Vocational Education, 42(10), 93–96.

[9] Ke, L., Li, Y., Xu, L., et al. (2023). *Blended Flipped Classroom Reform in Fundamentals of Nursing: Integration of Theory and Practice*. Chinese Journal of Nursing Education, 20(9), 1060–1065.

[10] Wei, J., Cong, Y., Min, N. (2022). **Application of Flipped Classroom in Fundamentals of Nursing*. Chinese Modern Distance Education of Traditional Chinese Medicine, 20(2), 42–44.

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