

Application of Carousel Teaching Model in Pre-employment Nursing Training for Undergraduate Nursing Interns in Yunnan in China

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Abstract Objective: To investigate the effect of carousel teaching model in pre-employment nursing training for undergraduate nursing interns. **Methodology:** 100 undergraduate nursing interns were grouped had been using non-probability sampling in July 2022, and 50 undergraduate nursing interns from a school who came to the hospital first were set as the control group and 50 undergraduate nursing interns from a school who came to the hospital later were set as the observation group, with the control group using the traditional pre-employment nursing training method and the observation group using the carousel teaching method for The control group used the traditional pre-employment nursing training method and the observation group used the carousel teaching model for pre-employment nursing training. **Results:** After the training, the pre-employment nursing performance and self-directed learning ability of the interns in the two groups were compared. The observation group had higher theoretical and operational scores in pre-employment nursing training than the control group ($P < 0.05$); the observation group had higher total scores in self-directed learning ability than the control group ($P < 0.05$), among which the observation group had higher scores in learning awareness, learning strategy, learning behavior and learning evaluation dimensions than the control group ($P < 0.05$), and the difference between the two groups in interpersonal skills dimension was not statistically significant ($P > 0.05$). The satisfaction of the observation group with the carousel teaching method was 98%. **Conclusion:** The carousel teaching method helps to improve the pre-service nursing training effect of undergraduate nursing interns and enhance the self-directed learning ability of undergraduate nursing interns.

Keywords: undergraduate nursing interns, pre-employment nursing training, carousel teaching model, self-directed learning

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1. Introduction

Undergraduate nursing interns (hereinafter referred to as nursing students) are the backbone of future clinical nursing work, and clinical internship is the key link to realize the transition from student to clinical nurse. [1,2]. The pre-service nursing training is an important period to transform and apply professional theoretical knowledge to clinical practice. Traditional pre-service nursing training for clinical practice nurses is mainly based on "knowledge" and "skills", with more content, single teaching method, lack of flexibility and poor teaching effect [3]. Research shows that there is much room to improve nursing students' self-directed learning ability,

and the training of nursing students' self-directed learning ability should be strengthened to explore lifelong learning ability and adapt to the rapid development of the nursing profession [4,5,6,7]. "The National Nursing Development Plan (2021-2025) of the 14th Five-Year Plan points out that the nursing workforce should be trained according to job requirements and innovative forms of nursing education should be encouraged [8].

2. Literature Review

The "dual system" education originated in Germany and was gradually developed from the medieval apprenticeship model to the "dual system" model in the context of the industrial revolution, combining the

traditional apprenticeship system with modern vocational education in the new era, focusing on the coordinated development of theoretical education and skills learning. [9,10] The Carousel Method is the "best way to learn". The carousel model is an action-oriented teaching method in "dual education", a teaching method that allows students to learn interactively to test their mastery of theoretical knowledge. [11,12] is suitable for both theory and practical classes. The carousel approach is used in vocational teaching classrooms [13,14], oral classroom teaching [15], and pharmacology classroom teaching [16], all of which reflect the practical nature and have a strong independent learning orientation. In the field of clinical care, one study applied the carousel method to health education for hypertensive patients, and the patients' self-management ability and quality of life were significantly improved after the intervention [17].

3. Methodology

In order to improve the effect of pre-service nursing training of nursing students and enhance their theoretical knowledge and nursing skills mastery, the nursing teaching and research department of our hospital applied the carousel teaching method to pre-service nursing training of nursing students.

3.1. Participants

100 undergraduate nursing interns were grouped had been using non-probability sampling in July 2022, and by convenience sampling method, non-same group of pre-employment nursing training interns, according to the order of internship time, 50 nursing undergraduate interns from one school who came to the hospital first were set as the control group, and 50 nursing undergraduate interns from one school who came to the hospital later were set as the observation group. There were 50 students in the control group, including 3 males and 47 females, aged 21-24 years old. The observation group consisted of 50 people, including 6 male and 44 female students, aged 21 to 24 years old. There were no statistically significant differences between the two groups in terms of general information such as age, gender, average grade point in school, and average GPA ($P > 0.05$), which were comparable, see Table 1. inclusion criteria: ① Full-time undergraduate nursing interns who had completed theoretical courses in school and transferred to the clinical practice phase. ② Informed consent and voluntary participation in the study. Exclusion criteria: nursing students who failed to participate in the whole pre-service nursing training. Nursing students in both groups were aware of the purpose of this study and voluntarily participated in this study.

Table 1. Comparison of general information between the two groups

Projects	Control group (n=50)	Observation group (n=50)	t/F	P-value
Age	21.8±1.07	22.1±0.91	-1.308	0.194
Gender			1.099	0.295
Male	3(6)	6(12)		
Female	47 (94)	44 (88)		
Ethnicity			3.175	0.75
Han Chinese	40 (80)	32 (64)		
Ethnic Minorities	10 (20)	18 (36)		
Place of origin			0.000	1.000
Rural	43 (86)	43 (86)		
City	7(14)	7(14)		
Enrollment Method			1.478	0.224
Bachelor's degree	18 (36)	24 (48)		
College	32 (64)	26 (52)		
Whether it is the nursing program of your choice			5.333	0.21
Yes	32 (64)	43 (86)		
No	18 (36)	7(14)		
Whether you like the nursing program			0.796	0.372
Like	42 (84)	45 (90)		
Dislike	8(16)	5 (10)		
Grade point average	84.6±4.21	83.34±3.33	1.648	0.103
Grade Point Average	3.44±0.70	3.43±0.67	0.141	0.888
Any independent learning experience in the learning process			0.344	0.558
There are	49 (98)	48 (96)		
No	1(2)	2(4)		
Whether there are learning difficulties in the learning process			0.000	1.000
There are	47 (94)	47 (94)		
No	3(6)	3(6)		
Participation in group learning during the study process			5.529	0.137
Never	0	0		
Occasionally	5 (10)	5 (10)		
Sometimes	15 (30)	10 (20)		
Frequently	28 (56)	26 (52)		
always	2(4)	9(18)		
Enrichment of personal learning resources			2.432	0.657
almost nothing	1(2)	0		
Not rich	2(4)	1(2)		
Not very rich	28 (52)	28 (56)		
Enrichment	21 (42)	20 (40)		
Very rich	0	1(2)		

3.2. Research Method

The nursing teaching and research department of the hospital was responsible for the pre-service nursing training teaching in both groups, and the director of the nursing teaching and research department served as the general director and was responsible for the quality control of the training process, and the teachers with bachelor's degree or above, intermediate level or above, and solid theoretical knowledge and clinical practice ability in each clinical department served as the training teachers. The teaching environment, content and hours are the same, and the interns are instructed to pay attention to the "Medical Classroom" WeChat public number a week before the class to preview the pre-service nursing training content.

3.2.1. Content and Arrangement of Pre-service nursing Training

Table 2. Schedule of routine pre-service nursing training items and hours for the control group

Serial number	Training content	Credit hours
1	Clinical teaching management system requirements and responsibilities, labor discipline	2 credit hours
2	Nursing instrument writing standard	2 credit hours
3	Nursing Core System	4 credit hours
4	Medical etiquette, dress code, humanistic care	2 credit hours
5	Nursing skills operation (vital sign measurement techniques, seven-step scrubbing technique, cardiopulmonary resuscitation techniques)	4 credit hours
6	Open nursing skills room for independent practice	2 credit hours

The control group used the traditional pre-service nursing training method, the classroom lecturer combined with PPT lectures, nursing students listened to the main indoctrination mode, after the class according to their own learning progress, through the public review the key content, the teacher to ask questions. The skill training used the conventional demonstration plus practice, and the teacher summarized and summarized the key points and difficulties of this training program in response to the students' practice.

3.2.2. Carousel Teaching Method Design

The observation group used the carousel teaching method for training in the classroom. The teaching mode was mainly based on independent learning by nursing students and guidance by the teacher.

(1) Formation of the carousel teaching design team: it consists of 1 chief nurse, 3 deputy chief nurses, 2 supervising nurses, 1 nurse practitioner, and 3 nursing graduate students. After discussion at the team meeting, a case study was designed according to the content of pre-service nursing training, integrating the themes with strong practical application in pre-service nursing training to form a case study. ① Graded nursing system; ② Checking system; ③ Handover system; ④ Basic clinical operation

techniques (two-person cardiopulmonary resuscitation technique, vital sign measurement technique, seven-step washing technique); ⑤ Standardized writing of nursing instruments, ⑥ Medical etiquette, dress code, and Humanistic care. The cases with strong clinical application are selected to reflect the practical, accurate, strict and complete characteristics, which can reflect the key points and difficulties of the discipline, and can also combine with the clinical reality, and the cases involve different nursing skills and coping abilities. The total number of training hours is the same as that of the control group, and the specific arrangement is 2 hours for issuing case tasks and response requirements; 2 hours for teacher guidance; 2 hours for intra-group communication and discussion; 4 hours for open nursing skills room practice; and 4 hours for practical debriefing.

(2) Pre-experiment: Ten nursing students were selected for the application of carousel teaching method in pre-service nursing training before the formal implementation, to monitor and quality control the whole process, and to modify and optimize the teaching program according to the feedback from the interns and the problems that occurred during the implementation. Two groups of nursing students changed the circular arrangement to parallel arrangement formation during the practical response. The circle arrangement was time-consuming and inapplicable when combining formations. When answering two-by-two, the authority of grading should be given to the teacher, as students have different levels of knowledge and understanding, and it is difficult to control the grading rules and evaluation items. Students on the questioning side listen to each other's answers, take brief notes and cooperate with the operation, and add and communicate at the end of the answer.

(3) Formal implementation of the teaching process

Preparation of teachers: ① Before implementing the training, the researcher conducted homogeneous training for the participating instructors, with the aim of making the instructors fully understand and master the content related to the theoretical model of the carousel teaching method, the training process, precautions, and how to ensure consistent training methods for the study subjects in the group. ② With the help of practical analysis of cases, the theories and skills of multiple disciplines such as core nursing system, basic nursing operations, and humanities are integrated to guide interns to explore, analyze, and solve nursing problems. The reference materials for pre-service nursing training mainly include nursing operation technique reference "Newly Compiled Scoring Standards for 50 Commonly Used Nursing Techniques and Operations" [18] and the core nursing system of the Second People's Hospital of Yunnan Province.

Preparation of nursing students: Before the training, members of the subject group instructed the nursing students who participated in the pre-service nursing training to make them familiar with and master the connotation, requirements and the step-by-step method and significance of the carousel teaching method, so that the nursing students can fully understand the importance and necessity of this pre-service nursing training.

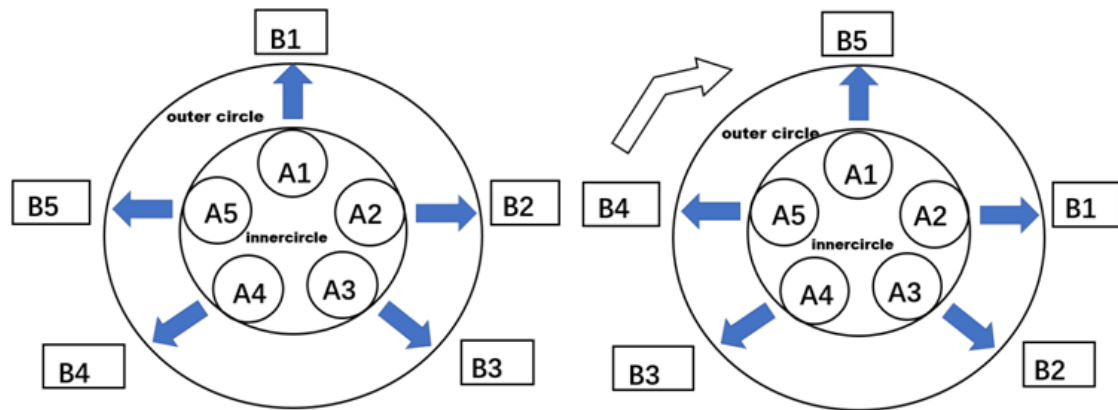


Figure 1. Carousel teaching model classroom case study practical response chart

Carousel Teaching Method Implementation Steps: At the beginning of the class, the teacher releases 2 practical case study questions designed by the nursing teaching and research team according to the curriculum, incorporating the key knowledge to be mastered into the cases, setting 5 small questions (with theory and practical operation) for each case. The class will be arranged according to the pre-class serial number 01 to 25 as A large group, 26 to 50 as B large group, each group gets 1 Each group is given one case problem, and every five people from 01 to 50 form a group. The group will exchange and discuss, extract the knowledge used in the case problem, communicate, summarize, understand and remember the knowledge, practice the nursing skills applied to the operation, and go to the nursing skills room to set up the operating environment and prepare the materials used in their answers. ② Carousel teaching method: A/B two groups cross-group, every 2 groups form a team, a total of 5 teams, a teacher is responsible for a team, arrange the position of the team members and the order of answering, the members of the team will each be given one of the 5 questions in the case they are discussing. The teacher will give the instruction to start the first round: a member of team A will read the questions, and the corresponding member of team B will answer and demonstrate the operation; the members of team A will listen to each other's answers, take brief notes and cooperate with the operation, and supplement and communicate after the answers. Each student's answer time is controlled at 3-7 minutes, after all the answers are finished, the teacher will issue the instruction of moving position, the second round: the position of group A members remains unchanged, group B members move one position to the right, the end members move to the first position on the left, the roles of the two groups are swapped, group B members read the questions, the corresponding group A members on the opposite side answer and practical demonstration. The members of group B listen to each other's answers, take brief notes and cooperate with each other in the operation, and make additions and exchanges after the answers are finished. After all the answers have been given, the teacher issues a closing instruction. The group will discuss and each person will speak for 1 to 2 minutes to summarize their own answers and the answers of the students across the room. The teacher evaluates and scores

each student's answer during the class, and provides guidance on difficult points to motivate each student to participate.

4. Data Collection

This study created questionnaires with the help of the Questionnaire Star website, and electronic questionnaires were used to answer in an anonymous manner. The researcher instructed the nursing students attending the pre-service nursing training to fill out the general information and the self-directed learning rating scale before the start of the class, explaining the main points and precautions to fill out and the purpose of the research. At the end of the pre-service training, the questionnaire was filled out again. ① Self-Rating Scale of Self-Directed Learning (SRSSDL) [19]: The Chinese version of SRSSDL has a Cronbach's alpha coefficient of 0.966 and a content validity of 0.963. It includes 5 dimensions of learning awareness, behavior, strategy, evaluation and interpersonal skills. The Likert 5 scale was used, with "never, sometimes or occasionally, often, always, or always" being assigned a score of 1 to 5, with a total score of 60 to 300, and the higher the score, the higher the level of self-directed learning. ② Pre-service nursing training theory test paper: theoretical test questions based on pre-service nursing training knowledge, with a score of 100 points. ③ Operation score: two-person cardiopulmonary resuscitation with 100 points, vital signs measurement with 100 points, seven-step scrubbing technique with 100 points, all based on clinical nursing technical operation scoring standard score scores. The assessment team was established, and a total of 6 teachers from clinical departments who are experienced in supervising examinations and familiar with nursing operation procedures and theoretical knowledge were selected by the nursing teaching and research department, all of whom are the total of each department.

Lead teachers and key teachers, unaware of the training methods and groupings, structured the scoring of each nursing student according to the nursing operation technical specifications and specific scoring rules to ensure the objectivity and fairness of the assessment.

Table 3. Comparison of self-directed learning scale scores between the two groups before and after training Score $\bar{x} \pm s$

Group	Learning Awareness		Learning Strategies		Learning Behavior	
	Pre-training	After training	Pre-training	After training	Pre-training	After training
Control group (n=50)	46.40±0.99	44.9±6.23	45.21±1.11	45.20±6.29	43.9±1.04	43.3±5.8
Observation group (n=50)	45.83±1.03	47.76±4.76	45.97±1.16	48.62±5.01	45.73±1.17	46.3±5.61
<i>t</i>	0.398	-2.578	-0.472	-3.006	-1.165	-2.629
<i>P</i>	0.692	0.011	0.638	0.003	0.247	0.010
Group	Learning Evaluation		Interpersonal skills		Total Score	
	Pre-training	After training	Pre-training	After training	Pre-training	After training
Control group (n=50)	45.45±7.52	44.56±7.12	45.42±6.85	45.94±6.19	226.4±32.16	223.9±26.17
Observation group (n=50)	45.66±6.78	47.18±4.74	46.73±7.17	47.42±4.68	229.95±34.08	237.28±22.25
<i>t</i>	-0.137	-2.166	-0.856	-1.348	-0.491	-2.755
<i>P</i>	0.891	0.033	0.395	0.181	0.625	0.007

Table 4. Comparison of pre-service nursing training operational and theoretical scores between the two groups after training Score $\bar{x} \pm s$

Group	Seven Step Scrubbing Technique	Vital signs measurement Technology	CPR techniques	Theoretical results
Control group (n=50)	98.12±0.19	95.54±2.00	95.12±1.34	94.41±1.74
Observation group (n=50)	99.7±0.08	98.18±1.24	96.10±2.37	96.52±1.79
t-value	-7.332	-7.926	-2.511	-5.931
P-value	0.000	0.000	0.014	0.000

5. Data Analysis

Data were analyzed using SPSS25.0 software, and quantitative data were expressed as mean \pm standard deviation ($\bar{x} \pm s$), and the count data were expressed as frequencies and percentages, and the χ^2 test, two independent samples t-test or rank sum test were used for comparison between groups. The test level $\alpha=0.05$, and the difference was considered statistically significant at $P<0.05$.

6. Results

6.1. Comparison of self-directed learning scale scores between the two groups before and after training See [Table 3](#).

6.2. Comparison of pre-service nursing training theoretical scores and operational scores between the two groups after training See [Table 4](#).

6.3. Satisfaction with the training format and delivery method after pre-service nursing training in the observation group was 98%.

7. Discussion

7.1. Carousel teaching method can improve nursing students' self-directed learning ability. The application of self-directed learning theory in nursing education first originated in the 1970s [20], and was first studied by the American educator Hall. Domestic research on self-directed learning is late, in 2012, scholar Shen Yuqin [21] Chinese version of the self-directed learning scale and surveyed 1500 nursing students in school, of which 992 undergraduate nursing students had a total survey value score of 224.32 ± 27.51 , the total survey value score

of the two groups before training in this study were higher than that study. Considering that with the continuous reform and progress of nursing education, the self-directed learning ability of nursing students in China has improved, but there is still room for improvement compared with the findings in the United States [5]. One scholar applied feedback audio instruction to undergraduate nursing students in a community nursing classroom and their total scores on self-directed learning scores improved after the intervention compared to pre-intervention, but the improvement in interpersonal dimension scores was not significant, consistent with this study [22]. The possible reason for this is that interpersonal skills are part of the personality traits of individuals, which are stable and cannot be easily changed only through short training, and require long-term and sustained development to improve their skills. However, the self-directed learning ability of nursing students plays a crucial role in the future career development of their nurses and the quality of patient care, and attention should be paid to the development of self-directed learning ability of nursing students at an early age to cope with the complex and challenging work in the health care industry.

7.2. Carousel teaching method can improve nursing students' pre-service nursing training examination results and enhance the pre-service nursing training effect. Pre-service nursing training is a key link for nursing students to enter clinical practice, and good pre-service nursing training can make nursing students better adapt to the transformation from school learning to clinical work, which affects the quality of nursing practice and their determination to engage in nursing work in the future [23,24]. In traditional training, most of the training is "duck and fill" teaching, with more training contents and cumbersome knowledge points, resulting in low interest of clinical internship nursing students in learning and poor training effect. In this study, the carousel teaching method

was adopted, and the results showed that the nursing skills and theoretical scores of the observation group were higher than those of the control group after the teaching (all $P < 0.05$). The observation group's satisfaction with the training form and teaching method after pre-service nursing training was 98%, and nursing students were more satisfied with this training method. The advantage of carousel teaching is that the nursing students are guided to analyze the nursing skills and knowledge points used in the cases independently in the form of cases, and the cases chosen by the members of the subject group are selected from real clinical situations, which is more in line with the modern teaching concept oriented to clinical needs. In the case design, the group fully integrates the core knowledge of pre-service nursing training into the cases, and helps nursing students grasp the knowledge points more deeply and accurately through group discussions, and through the carousel teaching, nursing students interactively rehearse the real use of nursing skills, which is conducive to enhancing the learning effect.

8. Limitations

This study only applied the carousel teaching method to pre-service nursing training, with limited implementation time and lack of team-based practical case design for multi-person cooperation. We plan to continue to improve the case and teaching session design later, and gradually expand the scope of application in clinical practice.

9. Conclusion

With the development of nursing discipline, higher requirements are put forward for nurses' job competency, and they must have self-directed learning and lifelong learning ability to adapt to the complex and changing clinical nursing work. The teaching process is no longer a one-way lecturer-oriented, passive learning of clinical internship nursing students following the ideas of the lecturer, but more and more inclined to teacher-led, independent learning and active thinking of nursing students teaching mode. The carousel teaching method is designed around the actual clinical needs of case analysis, including the effective use of theoretical knowledge to nursing skills, nursing students can only participate in the classroom group discussion by actively analyzing the case clues to find answers, the entire teaching process in stages, with group cooperation and practical demonstration, the form of progressive, conducive to enhancing the interest of nursing students self-directed learning, cultivate active learning ability, enhance the the effect of pre-service nursing training.

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Conflict of Interest Disclosure

There are no conflicts of interest.

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