ORIGINAL RESEARCH

Application of Network-Based PBL Model Combined with Role-Playing Method in Geriatric Nursing Teaching

Zhiju Gu, MD; Kexin Li, MD; Shanshan Ma, MM; Jiaqin Wang, MD; Sujuan Ren, MM; Jing Zhang, MD

ABSTRACT

Objective • To evaluate the effectiveness of using a combination of problem-based learning (PBL) and role-playing methods in geriatric nursing education through online networks.

Methods • The research objects of this paper were selected from nursing students, and the number of participants was 200. The research objects were selected from March 2019 to September 2021. The learning situation and related data of the above students were retrospectively analyzed. According to the teaching methods, the students were divided into groups. The students who received traditional teaching methods were included in the control group, with a total of 100 participants. The students who received network-based PBL mode combined with role-playing teaching were included in the observation group, with a total of 100 participants. The assessment results and learning effect evaluation of the two groups of students were compared, and the level of learning engagement and changes in critical thinking between the groups were compared.

Results • The scores of basic theoretical knowledge, clinical practice skills, and clinical case analysis of students in the observation group were higher than those of the control group ($P < .001$). The evaluation index of nursing students' learning effects was analyzed. The proportions of enhancing teacher-student interaction, improving team cooperation ability, improving autonomous learning ability and learning interest, improving analysis and problem-solving ability, improving theory combined with practice ability, improving communication and expression ability, improving work self-confidence, improving knowledge and vision, improving literature retrieval and evaluation ability in the observation group were higher than that in the control group ($P < .001$). After the teaching work, the overall learning input score, cognitive input score, behavior input score, emotional input score, learning harvest score, and learning satisfaction score of students in the observation group were higher than those of the control group ($P < .001$). After teaching, the scores of finding the truth, open mind, analytical ability, systematic ability, critical thinking self-confidence, curiosity and cognitive maturity of the students in the observation group were higher than those in the control group ($P < .001$).

Conclusion • The combined application of network-based PBL mode and role-playing method can significantly improve the teaching effects of geriatric nursing, with popularization value. (*Altern Ther Health Med.* 2024;30(1):282-288).

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Geriatric nursing focuses on studying and diagnosing the health problems of the elderly society and population. By analyzing the physiological, pathological, and psychological changes that occur with aging, as well as the elderly's social interactions, this discipline plays a crucial role in identifying existing and potential health issues among seniors.[1] Geriatric nursing is one of the important branches of nursing, covering basic, clinical, preventive, and rehabilitation medicine. This discipline boasts robust theoretical knowledge and practical application, making it highly influential across multiple disciplines. It requires students to be familiar with and master theoretical knowledge. At the same time, in the process of practical operation, they can flexibly use the knowledge they have learned and have the ability to analyze and solve problems. Therefore, the teaching of geriatric nursing is relatively challenging.[2] Because the physiological status of the elderly population changes with age, the nursing problem is

more complex than that of other age groups, with more difficult nursing. The traditional teaching method is associated with rote learning, which lacks practical application. There is a considerable gap between nursing students and clinical practice. Moreover, nursing students learn relevant theoretical knowledge passively under this teaching mode, which is difficult to improve their autonomous learning ability and cannot cultivate high-quality professional talents for clinical.[3]

With the continuous development of modern society and economy, the level of medical care is constantly improving. Therefore, the requirements for the training of nursing talents are gradually increasing. Based on high comprehensive quality and strong adaptability, the goal is to cultivate comprehensive talents in the frontline of medical and health services, which is currently the focus of medical nursing services.[4] Therefore, it is crucial to adopt advanced teaching models to train nursing talents. Problem-Based Learning (PBL) is a new interactive teaching model with teaching content as the center and nursing students as the main teaching subjects, which is widely used in clinical teaching at present.[5] Role-playing Teaching Method (RTP) is a scenario simulation teaching method, in which the teacher guides the actual role-playing in simulated scenarios, and the nursing students play different roles in the scenarios. The teacher summarizes and guides the virtual practical teaching methods. Therefore, combining the above two models in the teaching process can further improve the nursing students' adaptability and thinking ability, laying a solid foundation for their subsequent entry into clinical work.[6]

The application of a network-based Problem-Based Learning (PBL) model combined with the role-playing method in geriatric nursing teaching raises several key questions to be addressed. These include determining how to effectively implement the network-based PBL model for collaborative learning and problem-solving among nursing students, designing optimal geriatric nursing case scenarios, integrating role-playing to enhance practical understanding, evaluating the impact on critical thinking and communication skills, assessing learning outcomes, overcoming implementation barriers, and adapting the model for diverse student populations. By addressing these questions, we can explore the potential benefits and drawbacks of this approach and identify strategies to improve its effectiveness in preparing nursing students for geriatric care.

DATA AND METHODS

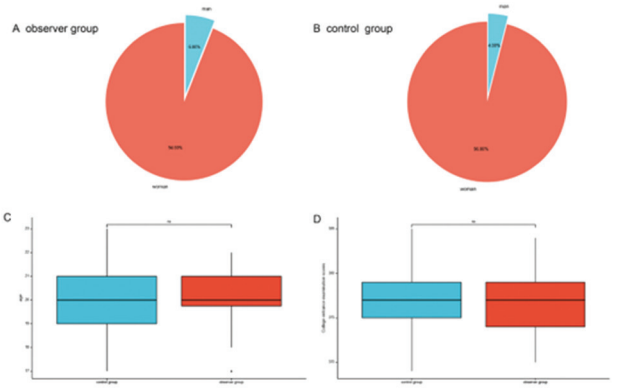
Data

A total of 200 nursing students were selected as the observation objects of this paper. The research objects were selected from March 2019 to September 2021. The relevant situations of the above students were retrospectively analyzed. According to the teaching methods, they were divided into two groups, with 100 students in the control group and 100 students in the observation group. The difference in data between groups was not statistically significant ($P > .05$). See Table 1 for details:

Table 1. Comparison of the data of two groups of nursing students

Group	n	Male (n)	Female (n)	Age (years)	College entrance examination scores (points)
Control group	100	4	96	20.11 ± 1.16	376.96 ± 3.33
Observation group	100	6	94	20.12 ± 1.07	376.84 ± 3.23
χ^2/t		0.421		0.386	0.280
P value		.516		.700	.780

Figure 1. Data analysis



Inclusion criteria, students who had passed the national unified examination and were directly enrolled in the nursing major of the school; students who knew the research content and voluntarily cooperate with relevant activities.

Exclusion criteria, those who did not cooperate in filling out the scale; students who adjusted their majors, suspended, or dropped out.

Methods

The control group consisted of nursing students who followed the conventional method, using the Ministry of Health's "Geriatric Nursing" textbook. Prior to each class, students were assigned preview tasks and encouraged to read relevant materials in their spare time. In class, the teacher used courseware to highlight key knowledge and explain difficult concepts. Finally, case analysis homework was assigned and classroom learning was evaluated. The nursing students in the observation group were taught using a combination of PBL instruction and network-based learning, supplemented by role-playing activities. The teaching methods were as follows:

(1) PBL mode of giving network: combined with the syllabus of "Geriatric Nursing", teachers can complete the screening of basic nursing knowledge, operation skills, common nursing problems, relevant precautions, and other contents of common diseases in the elderly, sort them into course materials, and push course materials to nursing students with the help of class groups, online meetings and relevant learning software and others. Nursing students can use the network platform to carry out self-study activities for the relevant contents of the course before class, and problem-based learning (PBL) can be applied to help students understand and learn the relevant knowledge points in the course of class, and students can apply the network platform

to consolidate and review the relevant knowledge learned in class after class. Pre-class stage where teachers can formulate learning objectives in combination with the contents of textbooks and syllabus and others, clarify the materials and exercises and others in the self-study stage, use learning software and class groups to push materials and exercises, and so on to students, and inform them of the self-study content and the time of completion of the test. The video of the nursing operation of typical cases in the geriatric ward and the latest retrieved relevant literature and others should be shared with the class group, which should be observed and learned by the students to help them understand the relevant theoretical knowledge and enhance their practical ability. The teachers should clarify the time of online question answering. After completing the question-answering work, teachers should analyze the self-study effects according to the questions raised by nursing students and the pre-class test results, and then adjust the teaching plan. To ensure the success of nursing students' group work, it is recommended that each group consist of 10 students and elect a team leader. All group members must complete self-study assignments within the given timeframe. Afterward, students should exchange and summarize any data collected and questions raised. This approach will enhance collaboration and facilitate effective teamwork. Class stage where each group leader should be responsible for the report of the group's learning results. The members of the group can freely discuss the relevant issues raised by the teacher. The teachers should sort out and summarize the content of the students' discussion, so as to deepen the students' understanding and memory of the knowledge points. After class stage where teachers should upload the learning results reported by each group in the learning software so that students can learn from each other. And teachers should push the classroom satisfaction questionnaire and after-school test questions and others on Wechat's official account. If the nursing students have questions when reviewing relevant knowledge points after class, they can ask the teachers in WeChat group, and the teachers need to answer them in time.

(2) Role-playing method: this includes, Teacher preparation where the teachers should select the contents suitable for role-playing teaching methods such as elderly disease nursing and home nursing according to the relevant contents and requirements of the syllabus. And the teachers should complete the arrangement of role-playing teaching content two weeks before the teaching work so that students can be fully prepared. And the grouping of the PBL teaching methods can be continued. Every two class hours, 4-5 groups of members should carry out a round of performance learning. The case preparation method can be selected according to the specific teaching content, including the teacher design, that is, the teachers should be responsible for the teaching of case methods and relevant precautions and the review of students' own designs. The performance content, performance time and participants, and others need to be compiled and adjusted according to the teaching content. Student preparation where students need to be well-prepared in terms of naming and training of each group. The first step is to issue the role-playing task to each group and encourage them to design a case that combines teaching content, collect relevant data, write the script, assign roles, and exercise the roles. Students should also be encouraged to use their spare time to retrieve relevant books and materials.

Site preparation, the bright and spacious laboratory should be selected as the role-playing site. The students in the class should sit around the performance group. Videos of students' performances can be taken during the course and shared with the learning group after class for students to learn. Implementation stage where a competition mechanism and reward system should be put in place to encourage students to voluntarily participate in the performance. Corresponding rewards should be given to students who have priority to complete the performance homework, which can help them build self-confidence and enhance their subjective initiative. The order of group performance can be determined by drawing lots, and the performance work can be completed in turn.

After the performances of each group, the students should be organized to discuss the contents of the performances of the group, and the teachers can make a summary speech and put forward suggestions for improvement. Before performing, students in each group should first complete the introduction of group name and performance content, and at the same time carry out a detailed introduction of the participants and roles. By following these guidelines, students will be better equipped to successfully complete their role-playing activities.

Observation indicators

The examination results of nursing students in the two groups were recorded. After the completion of the teaching work, the closed book examination was used to test the grasp situation of the basic theoretical knowledge of the students. The examination paper included blank filling questions, noun explanation, short answer questions, multiple-choice questions, and case analysis questions.. The teacher designed geriatric nursing analysis questions and case analysis questions (30 questions each), and the score range of each question was 0-100 points. Students randomly selected three questions from the question bank, which can evaluate students' clinical practice skills and case analysis results. The final score was the average of three achievements.

The evaluation of the learning effects of the students in the group was analyzed. After the teaching work was carried out, the students were organized to fill in the questionnaire, including whether to enhance the interaction between teachers and students, whether to improve teamwork ability, whether to improve the autonomous learning ability and interest, whether to improve the innovation ability, whether to improve the analysis and problem-solving ability, whether to improve the ability to combine theory with practice, whether to improve the communication and expression

Table 2. Comparison of the assessment results of two groups of nursing students (n = 100, points)

Group	Basic theoretical knowledge score	Clinical practice skills score	Clinical case analysis score
Control group	82.52 ± 3.39	84.04 ± 3.01	80.66 ± 2.59
Observation group	90.63 ± 4.50	89.98 ± 2.75	91.36 ± 3.02
t	14.497	14.398	26.616
P value	<.001	<.001	<.001

Figure 2. Analysis of assessment results

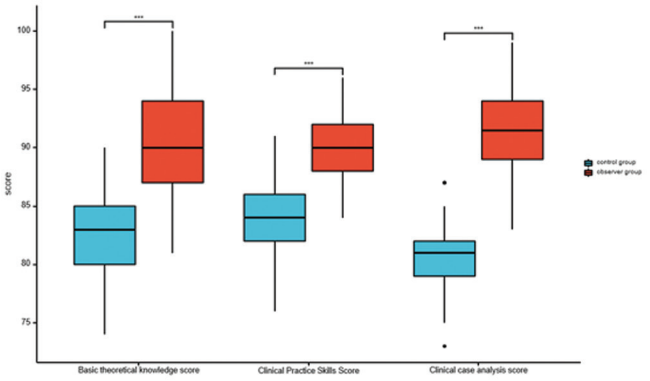
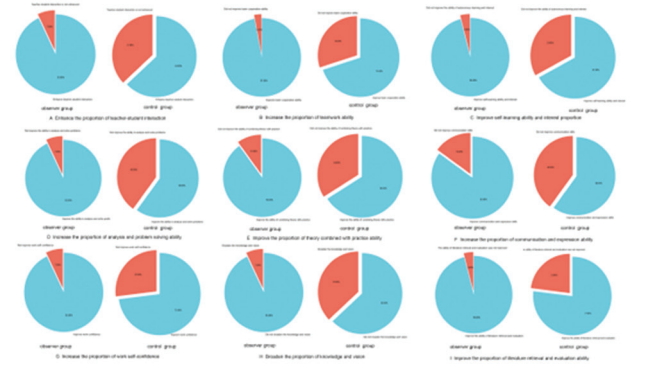


Table 3. Comparison of the learning effect evaluation of two groups of nursing students [n (%)]

group	n	Proportion of increasing teacher-student interaction	Proportion of improving teamwork ability	Proportion of improving autonomous learning ability and interest	Proportion of improving analysis and problem-solving ability	Proportion of improving theory combined with practice ability	Proportion of improving communication and expression skills
Control group	100	63 (63.00)	70 (70.00)	67 (67.00)	60 (60.00)	66 (66.00)	60 (60.00)
Observation group	100	93 (93.00)	97 (97.00)	96 (96.00)	93 (93.00)	90 (90.00)	85 (85.00)
χ^2	-	26.224	26.456	27.889	30.288	16.783	15.674
P value	-	.001	.001	.001	.001	.001	.001

Group	n	Proportion of improving self-confidence in work	Proportion of broadening knowledge and vision	Proportion of improving literature retrieval and evaluation ability
control group	100	73 (73.00)	63 (63.00)	77 (77.00)
Observation group	100	93 (93.00)	93 (93.00)	96 (96.00)
χ^2	-	14.174	26.224	15.457
P value	-	.001	.001	.001

Figure 3. Learning effect evaluation



ability, whether to improve the work self-confidence Whether to broaden the scope of knowledge and vision, whether to improve the ability of literature retrieval and evaluation, and other contents. The questionnaire was 100% returned, and each content included two options of "yes" and "no", and the proportion of "yes" was counted.

The level of students' learning engagement between groups was recorded, and the "Student engagement scale"[6] was applied before and after the teaching work, including the dimensions of behavior, cognition, and emotional engagement, involving a total of 57 items, and each item was assessed by the 4-level scoring method. The learning harvest involved 12 items, which were evaluated by the 4-level scoring method; and the learning satisfaction involved 7 items, and each item was assessed by a 7-level scoring method. The higher the score, the more dominant.

The changes of critical thinking of the two groups of students were counted, and were evaluated with the Chinese version of the critical thinking ability measurement table[7] before and after the teaching period. The inventory includes seven traits, namely finding the truth, opening the mind, analytical ability, systematization ability, self-confidence in critical thinking, thirst for knowledge, and cognitive maturity. Each trait consists of 10 items with a score range of 10-60 points, resulting in a total score range of 70-420 points. A higher score indicates stronger critical thinking abilities.

Statistical analysis

The relevant data of this study were statistically processed by SPSS v.20.0. The measurement data of the two groups of nursing students were expressed by Mean ± standard deviation and the results were obtained by *t* test. The count data between groups were expressed in the form of "%", and the results were obtained by chi square test. If the result showed $P < .05$, it meant that the difference in data was statistically significant.

RESULTS

Comparison of assessment results between groups

According to the data in Table 2, the basic theoretical knowledge, clinical practice skills and clinical case analysis scores of nursing students in the observation group were significantly higher than those of the control group ($P < .05$).

Comparison of learning effect evaluation between groups

According to the data in Table 3, in the questionnaire of the students in the observation group, the proportions of enhancing teacher-student interaction and improving teamwork ability, improving autonomous learning ability and interest, improving innovation ability, improving problem-solving ability, improving theory combined with practice ability, improving communication and expression ability, improving work self-confidence, improving literature search and evaluation ability, and broadening knowledge and vision were significantly higher than those in the control group ($P < .05$).

Comparison of level of learning engagement between groups

Analyzing the data in Table 4 and Table 5, before the teaching activities, the scores of the two groups of the

Table 4. Comparison of the scores of the learning engagement level of the two groups before teaching (n = 100, points)

group	Overall learning engagement score	Cognitive engagement score	Behavior engagement score	Emotional engagement rating	Learning harvest score	Learning satisfaction score
Control group	2.25 ± 0.56	2.28 ± 0.45	2.07 ± 0.36	2.82 ± 0.52	2.12 ± 0.43	4.49 ± 0.56
Observation group	2.19 ± 0.61	2.19 ± 0.42	1.95 ± 0.30	2.76 ± 0.47	2.04 ± 0.35	4.16 ± 0.44
t	1.473	1.221	1.760	1.954	1.998	1.762
P value	.142	.223	.080	.052	.068	.080

Table 5. Comparison of learning engagement scores between the two groups after teaching (n=100, points)

group	Overall learning engagement score	Cognitive engagement score	Behavior engagement score	Emotional engagement score	Learning harvest score	Learning satisfaction score
Control group	2.70 ± 0.48	2.96 ± 0.20	2.19 ± 0.42	2.99 ± 0.27	2.38 ± 0.49	4.82 ± 0.39
Observation group	3.97 ± 0.17	3.29 ± 0.46	3.50 ± 0.50	3.75 ± 0.44	3.31 ± 0.46	6.66 ± 0.54
t	21.776	21.118	23.284	18.927	20.590	36.047
P value	.001	.001	.001	.001	.001	.001

Figure 4. Analysis of learning engagement level before teaching

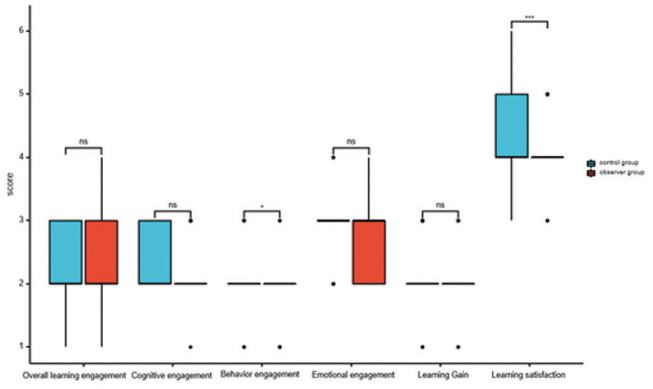
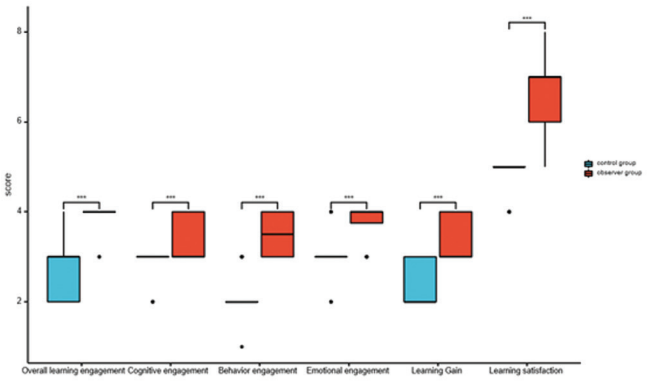


Figure 5. Analysis of learning engagement level after teaching



"learning engagement scale of College students" were compared, and the difference was not obvious ($P > .05$). After the implementation of teaching activities, the scores of all items showed an upward performance, and the observation group accounted for a higher level ($P < .05$).

Comparison of critical thinking between groups

According to the data in Table 6, there was no significant difference between the two groups in the scores of each dimension of critical thinking of students before teaching ($P > .05$). Analyzing the data in Table 7, after teaching, the scores of each dimension of students in the observation group were significantly higher than those of the control group ($P < .05$).

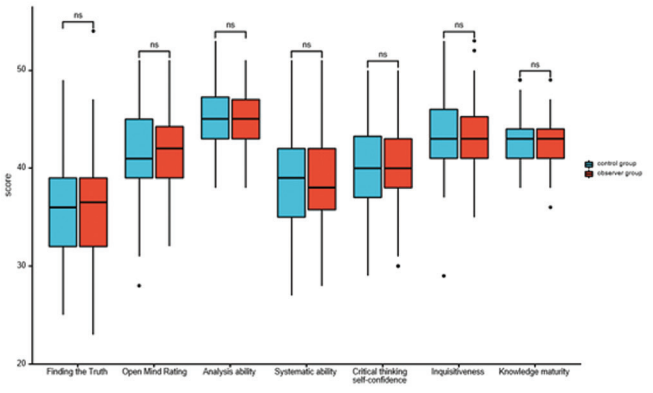
DISCUSSION

Geriatric nursing focuses on maintaining or restoring health status and promoting the improvement of health status, actively preventing and controlling disability caused by acute and chronic diseases, giving play to patients' daily living ability, maintaining their body function to a great extent, and improving their life comfort until the patients die.[4,5] The aging process of the population in China is relatively fast. In order to provide high-quality nursing services to the population of elderly patients, nursing majors offer geriatric nursing courses, which mainly cover the contents such as home care for elderly patients and the nursing of common diseases of the elderly population. Relevant studies have clearly pointed out that,[6] there is a close relationship between the learning effects of nursing students and teaching methods, and a reasonable selection of scientific and reliable teaching methods is of great value in ensuring teaching quality.

Table 6. Comparison of critical thinking scores of two groups of nursing students before teaching (n=100, points)

group	Find the truth score	Open mind rating	Analysis ability score	Systematic ability score	Critical thinking self-confidence score	Curiosity score	Cognitive maturity score
Control group	35.94 ± 5.43	41.63 ± 4.41	45.41 ± 3.17	38.72 ± 4.49	40.40 ± 4.48	43.21 ± 3.53	42.88 ± 2.28
Observation group	35.90 ± 5.34	41.47 ± 4.24	45.12 ± 3.12	38.51 ± 4.34	40.19 ± 4.39	43.20 ± 3.34	42.62 ± 2.14
t	0.066	0.196	0.517	0.274	0.336	0.144	1.026
P value	0.948	0.845	0.606	0.784	0.738	0.886	0.306

Figure 6. Analysis of critical thinking scores before teaching

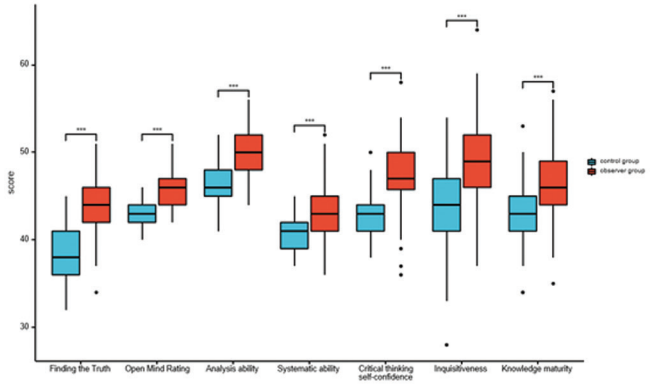


The aging population in China continues to rise dramatically. In 2015, the number of people aged 60 and above reached 220 million, accounting for approximately 16% of the total population. By 2018, this proportion had increased to 17.8%. As the standards and organization of the elderly care industry continue to improve, healthcare services have become an essential component of elderly care.

Table 7. Comparison of critical thinking scores after teaching (n=100, points)

group	Find the truth score	Open mind rating	Analysis ability score	Systematic ability score	Critical thinking self-confidence score	Curiosity score	Cognitive maturity score
Control group	38.60 ± 2.99	42.88 ± 1.14	46.55 ± 2.07	40.77 ± 2.00	42.69 ± 2.47	43.91 ± 4.49	43.06 ± 3.53
Observation group	44.24 ± 3.02	45.80 ± 2.06	49.74 ± 2.54	42.98 ± 3.06	47.43 ± 3.64	49.02 ± 4.54	46.18 ± 3.85
t	13.459	12.261	9.630	5.968	10.701	8.079	5.904
P value	.001	.001	.001	.001	.001	.001	.001

Figure 7. Critical thinking scores after teaching



Consequently, there is a clear upward trend in the demand and requirements for professionals in this field.

In the application process of traditional teaching methods, students reflect that the classroom content is bland and dull, it is difficult to experience the real feelings of older patients, the learning enthusiasm is low, and it is difficult to flexibly apply the learning content, which cannot cultivate the comprehensive ability of nursing students.[7,8] The network-based PBL model is a product of the development of Internet technology. It combines PBL teaching method with continuously updated network, big data, etc., combines online and offline modes, breaks the restrictions of time and space on teaching, gives full play to the advantages of PBL teaching mode, integrates diversified network resources and related teaching resources, so that students can actively explore, analyze and solve problems in the learning process, which can enhance the motivation and effects of learning.[9,10] The role-playing teaching method requires students to write cases and perform the relevant contents written by themselves, which can provide opportunities for students to cooperate with each other and fully exercise their cooperation ability.[11,12] In the process of case preparation and performance, students can fully feel the role of older patients, face the problems that may be encountered in the process of clinical practice, consciously integrate the knowledge learned, and carry out thinking and analysis of the connection between theory and practice in combination with the actual situations. This teaching mode can shorten the distance between on-campus teaching and clinical practice.[13,14]

In the research, the evaluation results, learning effect evaluation, learning engagement level, and critical thinking indicators of students in the observation group were significantly better than those of the control group, indicating that in the teaching process of geriatric nursing, the combined application of the role-playing method and network-based PBL mode can improve the teaching effects, improve students' learning performance and learning effects. The reasons were analyzed. In the network-based PBL mode, students can plan the preview time by themselves with the help of rich network resources, and then the group discussion method was used to summarize the problem analysis situations to teachers through WeChat. Teachers can adjust the teaching plan according to the content of nursing students' discussion and feedback.[15] The role-playing method can help students change their learning attitude, and perform by playing the role of patients, which can effectively improve their comprehensive ability and ensure the quality of teaching. The combined application of the above two teaching schemes can enable students to actively learn and understand relevant knowledge. In teaching activities, students occupy a dominant position, while breaking the restrictions of time and space on learning, so that students can freely learn relevant professional knowledge,[16,17] strengthen the understanding and memory of knowledge, and ultimately improve the learning effects.[18] In addition, the above two teaching methods can stimulate students' interest in learning, enable students to think independently and extend learning-related knowledge, and fully exercise their critical thinking.[19,20]

The limitations of this study include potential sampling bias, as it may have been conducted with a specific population, limiting generalizability. The assessment methods used, such as closed-book examinations and questionnaires, may not fully capture students' skills and real-world application of knowledge. Subjectivity in scoring, particularly in areas like interpretation and judgment, could introduce inconsistency despite efforts to ensure fairness. Self-reporting bias in questionnaires may impact the accuracy of collected data. Time constraints may have limited the depth of teaching interventions and data collection. External factors, such as prior knowledge and personal motivations, were not accounted for and could influence outcomes. Researcher bias may have influenced various stages of the study. Acknowledging these limitations is important for understanding the study's outcomes and identifying opportunities for future research.

In conclusion, the combination of network-based PBL mode and role-playing method should be applied in geriatric nursing teaching, with considerable effects and popularization value.

DATA AVAILABILITY

The experimental data used to support the findings of this study are available from the corresponding author upon request.

CONFLICTS OF INTEREST

The authors declared that they have no conflicts of interest regarding this work.

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AUTHOR CONTRIBUTIONS

Kexin Li and Shanshan Ma are the co-first authors of the article

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