



The Development of Clinical Thinking Ability Through Problem-Based Learning for Nursing Students in Vocational College

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Abstract

The objective of this study was to compare the learning achievement of nursing students before and after using learning to the problem-based learning and to study the clinical thinking ability of nursing students after learning to the problem-based learning. A quantitative research methodology was employed, utilizing cluster random sampling for sample selection and percentage, mean, standard deviation, dependent t-test, and content analysis for data analysis. The sample group consisted of second-year nursing students in the School of Nursing, Kunming Health Vocational College, Kunming, Yunnan Province, China, in the second semester of the 2025 academic year, totaling 44 students in 1 class, which was obtained from cluster random sampling execution steps. Research instruments included three parts: 1) The problem-based learning plan, 2) the learning achievement test, and 3) the clinical thinking ability assessment form. The statistics used for data analysis were percentage, mean, standard deviation, Paired-samples t-test, and content analysis, respectively. The research findings revealed that the learning achievement of nursing students who received problem-based learning was significantly higher than before studying at the .01 level, and their clinical thinking ability was at a high level.

Keywords: Problem-Based Learning, Clinical Thinking Ability, Vocational Nursing Education, Nursing Students

1. Introduction

With the ongoing advancement of healthcare systems and the increasing complexity of clinical environments, nursing professionals are required to possess not only solid theoretical knowledge and technical skills but also strong clinical thinking ability. Clinical thinking ability refers to the capacity to analyze clinical information, identify patient problems, and make appropriate and timely clinical judgments. It has become a core competency in nursing education and clinical practice (Wei et al., 2024; Wang et al., 2024).

In vocational nursing education, students are expected to complete their professional training within a relatively short educational cycle and rapidly transition from classroom learning to clinical practice. However, previous studies have reported that vocational nursing students often demonstrate insufficient clinical thinking ability, which may affect the quality of clinical decision-making and patient care (Li, Li, & Fang, 2022; Liu, 2022). This limitation may be associated with restricted clinical exposure and the continued predominance of traditional lecture-based teaching methods. Teacher-centered instruction emphasizes knowledge transmission rather than active problem-solving and analytical training, thereby limiting students' opportunities to apply theoretical knowledge in authentic clinical contexts (Zhang et al., 2020)(Fernández-Pascual et al., 2020).

Problem-Based Learning (PBL) is a student-centered and problem-driven instructional

approach that emphasizes active learning, collaborative inquiry, and reflective thinking. In nursing education, PBL has been widely applied to promote the development of higher-order cognitive abilities. Empirical studies have demonstrated that PBL can significantly improve students' learning achievement, critical thinking ability, and professional competence (Gao et al., 2024; Zhou et al., 2023). In addition, research in vocational nursing education has indicated that structured PBL interventions contribute to enhancing students' clinical reasoning and comprehensive analysis abilities (Yang et al., 2025; Yao, 2024).

Although the effectiveness of PBL has been supported in various nursing education contexts, empirical evidence specifically examining its impact on clinical thinking ability among vocational nursing students remains limited. Particularly, within structured vocational nursing curricula, systematic investigations into measurable changes in clinical thinking ability are still insufficient (Ao et al., 2020).

Therefore, this study aims to examine the effectiveness of problem-based learning in enhancing clinical thinking ability among vocational nursing students, providing evidence-based support for instructional innovation in vocational nursing education.

2. Literature Review

Researchers conducted a review of the literature related to Problem-Based Learning (PBL) and the development of clinical thinking ability in nursing education. The purpose of this review is to clarify the theoretical foundation of PBL, examine the characteristics of clinical thinking ability among nursing students, and explore the relationship between PBL and the cultivation of clinical thinking ability. This section is divided into three parts.

1. Problem-Based Learning in Nursing Education

Problem-Based Learning (PBL) was first introduced in medical education and has gradually been applied in nursing education as a student-centered teaching strategy. Based on constructivist learning theory, PBL emphasizes learning through authentic clinical problems. Students are encouraged to identify learning issues, search for relevant evidence, and construct knowledge through discussion and reflection.

Previous studies have shown that PBL can improve learning motivation and promote self-directed learning (Wei et al., 2024). In geriatric nursing teaching, Li, Li, and Fang (2022) found that PBL combined with case discussion enhanced students' engagement and strengthened their understanding of nursing procedures. In addition, Yao (2024) reported that structured PBL activities improved students' classroom participation and facilitated the integration of theory with clinical practice.

Compared with traditional lecture-based methods, PBL shifts the focus from teacher-centered knowledge transmission to student-centered inquiry. Students analyze patient conditions, discuss possible nursing interventions, and reflect on their reasoning process. Such learning activities provide opportunities for deeper cognitive processing and are considered beneficial for the development of professional competence in nursing education (Zhou et al., 2023).

2. Clinical Thinking Ability of Nursing Students

Clinical thinking ability refers to the comprehensive cognitive capacity that enables nursing students to collect patient information, analyze clinical data, make judgments, and implement appropriate nursing interventions. It includes critical thinking, systematic analysis, and evidence-based decision-making. Clinical thinking ability is widely regarded as a core competency that directly influences patient safety and quality of care (Wang et al., 2024).

Researchers have attempted to construct evaluation frameworks for clinical thinking ability. Zhang et al. (2020) designed a rating scale to evaluate clinical thinking performance in surgical nursing contexts, highlighting the multidimensional nature of clinical reasoning. Ao et al. (2020) further proposed a measurement and evaluation framework for PBL in geriatric nursing teaching, emphasizing structured assessment tools to monitor learning outcomes.

However, empirical findings indicate that higher vocational nursing students often demonstrate relatively weak clinical thinking ability. Liu (2022) reported that limited clinical exposure and traditional teaching methods restricted students' opportunities for systematic analysis and independent judgment. Wang et al. (2024) further identified insufficient interactive learning strategies as an important influencing factor. In geriatric nursing contexts, the demand for strong clinical thinking ability is particularly urgent due to the complexity of elderly patients' health conditions (Gao et al., 2024).

3. Relationship between PBL and Clinical Thinking Ability

A number of recent studies suggest that PBL has a positive influence on clinical thinking ability. Through structured problem analysis and collaborative discussion, students are encouraged to engage in active inquiry and reflective learning.

Yang et al. (2025) found that a CBL–PBL integrated teaching model significantly improved clinical thinking ability among higher vocational nursing students. Zhou et al. (2023) reported that blended teaching incorporating PBL enhanced both clinical thinking and innovation ability. Yao (2024) demonstrated that PBL combined with case analysis strengthened students' ability to systematically evaluate patients' conditions.

Zhang (2021) also showed that simulation-based PBL supported the development of analytical and reflective skills. Although these studies provide supportive evidence, most focus on undergraduate nursing students or specific clinical specialties. Research specifically examining the effectiveness of PBL in enhancing clinical thinking ability among vocational nursing students remains limited. Therefore, further empirical investigation is needed to provide evidence-based support for teaching reform in vocational nursing education.

3. Research Methodology

1. Research design

This quasi-experimental study aimed to compare learning achievement of nursing students before and after using learning to the problem-based learning and study the clinical thinking ability of nursing students after learning to the problem-based learning. A single group of students was assessed before and after the problem-based learning intervention to examine changes in learning achievement and clinical thinking ability. The researcher adopted a one-group pretest-posttest design according to the objectives of this study, as shown in Table 3.1.

Table 3.1: The development of clinical thinking ability through problem-based learning for nursing students in vocational college

Objectives of the experiment	Experimental plan			Analytical methods
1. To compare learning achievement of nursing students before and after using learning to the problem-based learning.	The one-group pretest-posttest design			t-test dependent
	Pre-Test	Test	Post-test	
	T1	X	T2	
	T1 instead for assessing learning achievement (pre-test)			

	X instead for learning to the problem-based learning. T2 instead for assessing learning achievement (post-test)					
2. To study the clinical thinking ability of nursing students after learning to the problem-based learning.	The one-shot case study <table><tr><th>Test</th><th>Post-test</th></tr><tr><td>X</td><td>T</td></tr></table> X instead for learning to the problem-based learning. T instead for assessing of the clinical thinking ability	Test	Post-test	X	T	$\bar{x}$, SD.
Test	Post-test					
X	T					

2. Participants

The population consisted of second-year nursing students in the School of Nursing, Kunming Health Vocational College, Kunming, Yunnan Province, China, in the second semester of the 2025 academic year, totaling 496 students in 10 classes.

The sample group consisted of second-year nursing students in the School of Nursing, Kunming Health Vocational College, Kunming, Yunnan Province, in the second semester of the 2025 academic year, totaling 44 students in 1 class, which were obtained from cluster random sampling. Execution steps: 1) Nursing students of the second grade in the Nursing College of Kunming Health Vocational College, Yunnan Province(overall), and 2) Randomly select one complete class (cluster randomization). 3) All 44 students in the selected class (research sample).

3. Research Instruments

1. A problem-based learning teaching plan designed for a nursing course.
2. A learning achievement test assessing students' theoretical and practical knowledge.
3. A clinical thinking ability assessment scale measuring critical thinking, systematic thinking and evidence-based thinking

4. Instructional Procedure

Problem-Based Learning:

- 4.1 Preparation and Group Division
- 4.2 Problem Selection and Question Raising
- 4.3 Independent Inquiry and Group Discussion
- 4.4 Case Diagnosis and Plan Formulation
- 4.5 Evaluation and Summary

5. Data Collection

5.1 Literature Research

Relevant literature related to clinical thinking ability and PBL in nursing education was collected through academic databases and nursing education journals. Previous studies have shown that vocational nursing students often demonstrate insufficient clinical thinking ability due to limited structured reasoning training (Liu, 2022; Wang et al., 2024). Research has also indicated that PBL can effectively enhance students' clinical thinking ability through case-based analysis and collaborative learning (Zeng, 2023; Li, Li, & Fang, 2022). These findings provided the theoretical foundation for designing the teaching intervention.

5.2 Teaching Intervention

The teaching intervention lasted for two months and consisted of three rounds of PBL

activities. Each round included presenting an elderly care case, identifying key nursing problems, organizing group discussion, conducting self-directed learning, formulating nursing care plans, and completing reflective evaluation. Structured PBL implementation has been shown to promote active participation and strengthen clinical reasoning ability (Yao, 2024). During the intervention, teachers acted as facilitators to guide discussion and support students in refining clinical judgments.

5.3 Measurement Method

Students' clinical thinking ability was assessed using a Clinical Thinking Ability Scale applied in nursing education research (Li et al., 2022; Zhang et al., 2020). Previous studies have confirmed its reliability and validity in evaluating clinical thinking development (Gao et al., 2024). The scale was administered before and after the intervention.

6. Data Analysis

6.1 Use the average value ($\bar{x}$) and standard deviations (SD.) to analyze the learning achievement of students and then compare the scores before and after the experiment by testing the dependent T value (t-test dependent).

6.2 To analyze the critical thinking ability. Use the mean ($\bar{x}$), standard deviation (SD.)

Data was analyzed using statistical software. Descriptive and inferential statistics were employed in accordance with the research objectives.

For learning achievement, descriptive statistics including mean ($\bar{x}$) and standard deviation (SD) were calculated to summarize students' performance in both the pre-test and post-test. To determine whether problem-based learning resulted in a statistically significant improvement, a paired-samples t-test was conducted. Statistical significance was set at $\alpha = .05$.

For clinical thinking ability, descriptive statistics (mean and standard deviation) were used to assess the overall level and dimensional performance following the intervention. The interpretation of ability levels was based on predetermined criteria corresponding to the Likert scale used in the instrument.

Prior to data analysis, the content validity of the research instruments was evaluated by subject-matter experts. The instrument quality assessment ensured that the test items adequately represented the intended constructs.

4. Results

4.1 Comparison of learning achievement of students before and after using learning to the problem-based learning.

Data analysis to answer research question 1: Is the learning achievement of nursing students who have received problem-based learning higher after studying than before studying? The results of the data analysis are presented by the researcher as follows:

4.1.1 t-test dependent analysis of learning achievement of nursing students who received problem-based learning before and after learning

Table 4.1 presents the t-test dependent results of the learning achievement of nursing students who have received problem-based learning before and after learning, including mean, standard deviation, t value, df, and p value, verifying the significance of the improvement in learning achievement (significance level $\alpha = .05$).

Table 4.1: t-test dependent analysis of learning achievement of students who received problem-based learning before and after learning

Test	N	Full score	$\bar{x}$	S.D.	t	df	Sig.
Pre-test	44	40	21.18	1.126			

Post-test	44	40	33.16	2.199	-48.586	43	0.000
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As can be seen from Table 1, the improvement in learning achievement is statistically significant ($t=-48.586$, $p<0.001$). This result shows that problem-based learning significantly improves students' total learning achievement, and hypothesis H.1 (The learning achievement of nursing students who have received problem-based learning is higher after studying than before studying) is established.

4.1.2 Descriptive statistical analysis of the learning achievement of students who received problem-based learning before and after learning

Table 2 presents descriptive statistical analysis that was conducted on the nursing students' total learning achievement scores and the learning achievement test scores in four dimensions: Common nutritional problems and dietary assessment for the elderly. Identification and diagnosis of diet-related problems for the elderly, developing a dietary care plan for the elderly and implementing and evaluating dietary care for the elderly in order to understand the students' overall performance in the pre-test and post-test.

Table 2: Descriptive statistics of learning achievement of nursing students who received problem-based learning before and after learning

Dimensions	Pre-test (Full score: 40)		Post-test (Full score: 40)		Difference	Percentage of difference
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Common nutritional problems and dietary assessment for the elderly	5.39	0.493	8.45	0.504	3.06	56.77%
Identification and diagnosis of diet-related problems for the elderly	5.14	0.409	7.75	0.719	2.61	50.78%
Developing dietary care plan for the elderly	5.20	0.408	8.59	0.693	3.39	65.19%
Implementation and evaluation of dietary care for the elderly	5.45	0.504	8.36	0.685	2.91	53.39%
All	21.18	1.814	33.15	2.601	11.97	56.52%

According to the data in Table 2, the overall learning achievement of nursing students who have received problem-based learning increased from 21.18 points in the pre-test to 33.15 points in the post-test, an increase of 11.97 points and an increase of 56.52%.

From the perspective of specific dimensions, the improvement Developing a dietary care plan for the elderly is the most significant, from 5.20 points in the pre-test to 8.59 points in the post-test, an increase of 3.39 points and an increase of 65.19%. The second is common nutritional problems and dietary assessment for the elderly, which increased from 5.39 points in the pre-test to 8.45 points in the post-test, an increase of 3.06 points and an increase of 56.77%. The third is implementation and evaluation of dietary care for the elderly, which increased from 5.45 points in the pre-test to 8.36 points in the post-test, an increase of 2.91 points, and an increase of 53.39%. Finally, identification and diagnosis of diet-related problems for the elderly increased from 5.14 points in the pre-test to 7.75 points in the post-test, an

increase of 2.61 points and an increase of 50.78%.

Summary: The descriptive statistical results indicate that after receiving problem-based learning, nursing students demonstrated a substantial improvement in their overall learning achievement, with an average increase of over 56%. Across all four dimensions, there was a notable upward trend in performance, with the most pronounced gains in developing dietary care plans. This suggests that the PBL approach is effective in enhancing students' theoretical knowledge and practical application abilities in the field of elderly dietary care.

4.2 Study of clinical thinking ability after receive learning with problem-based learning

Data analysis to answer research question 2: What is the level of clinical thinking ability of nursing students who have received problem-based learning? The results of the data analysis are presented by the researcher as follows:

Table 3: Clinical Thinking Ability result of nursing students after receiving learning with problem-based learning

Dimensions	Evaluation results		ability level	Number
	$\bar{x}$	S.D.		
1. Critical Thinking Ability	3.45	0.04	High	1
1.1 Proactively question dietary care issues	3.50	0.59	High	1
1.2 Make optimal dietary decisions based on the elderly person's overall condition	3.41	0.50	High	4
1.3 Compare new technologies with traditional dietary care routines	3.46	0.55	High	2
1.4 Evaluate Care Effectiveness and Adjust Measures	3.43	0.59	High	3
2. Systematic Thinking Ability	3.44	0.03	High	2
2.1 Systematically Collect Dietary-Related Information	3.48	0.59	High	1
2.2 Identify Existing/Potential Dietary Problems	3.46	0.55	High	2
2.3 Develop Personalized Diet Plans	3.39	0.62	High	4
2.4 Evaluate Care Effectiveness and Adjust Measures	3.43	0.59	High	3
3. Evidence-Based Thinking Ability	3.43	0.01	High	3
3.1 Retrieving Relevant Evidence Based on Dietary Issues	3.41	0.58	High	3
3.2 Assessing the Degree of Consistency Between Evidence and Clinical Practice	3.46	0.59	High	1

3.3 Translating Evidence into Dietary Care Practice	3.43	0.59	High	2
Summary of the overall results	3.44	0.03	High	

From table 3 overall, the nursing students have high clinical thinking ability ($\bar{x} = 3.44$, S.D. = 0.03). Specifically, in each aspect, nursing students demonstrate high levels of clinical thinking ability. The high level of clinical thinking ability is critical thinking ability ($\bar{x} = 3.45$, S.D. = 0.04). Next up is systematic thinking ability ($\bar{x} = 3.44$, S.D. = 0.03) and evidence-based thinking ability ($\bar{x} = 3.43$, S.D. = 0.01).

When considering each item in terms of clinical thinking ability, it was found that nursing students have high-level clinical thinking ability overall. The highest-ranked issues are: Proactively question dietary care issues ($\bar{x} = 3.50$, S.D. = 0.59), compare new technologies with traditional dietary care routines ($\bar{x} = 3.46$, S.D. = 0.55), evaluate care effectiveness and adjust measures ($\bar{x} = 3.43$, S.D. = 0.59), and make optimal dietary decisions based on the elderly person's overall condition ($\bar{x} = 3.41$, S.D. = 0.50), respectively.

When considering each item in terms of systematic thinking ability, it was found that the nursing students have high-level clinical thinking ability overall. The highest-ranked issues are: Systematically collecting dietary-related information ($\bar{x} = 3.48$, S.D. = 0.59); identifying existing/potential dietary problems ($\bar{x} = 3.46$, S.D. = 0.55); evaluating care effectiveness and adjusting measures ($\bar{x} = 3.43$, S.D. = 0.59); and developing personalized diet plans ($\bar{x} = 3.39$, S.D. = 0.62), respectively.

When considering each item in terms of evidence-based thinking ability, it was found that nursing students have high-level clinical thinking ability overall. The highest-ranked issues are: Assessing the consistency between evidence and clinical practice ($\bar{x} = 3.46$, S.D. = 0.59), translating evidence into dietary care practice ($\bar{x} = 3.43$, S.D. = 0.59), and retrieving relevant evidence based on dietary issues ($\bar{x} = 3.41$, S.D. = 0.58), respectively.

5. Conclusion

1. The learning achievement of nursing students who have received problem-based learning is higher after studying than before studying at the .01 level.
2. The clinical thinking ability of nursing students who have received problem-based learning is at a high level.

6. Discussion

The findings of this study confirm the effectiveness of problem-based learning (PBL) in enhancing both learning achievement and clinical thinking ability among vocational nursing students. These results are consistent with the research hypotheses and are strongly supported by theoretical frameworks and empirical evidence reviewed in Chapter 2. The following section provides a detailed analysis of the mechanisms through which PBL contributed to these improvements.

1. The learning achievement of nursing students improved significantly after problem-based learning

The results indicate that, following the PBL intervention, the overall learning achievement of vocational nursing students increased by 56.52% from pre-test to post-test, and all four core dimensions of the Elderly Dietary Care course demonstrated significant improvement. These findings suggest that PBL effectively addresses the limitations of traditional teacher-centered, lecture-based indoctrination, which often emphasizes passive knowledge transmission. This

result is consistent with the findings of Zeng Lichang (2023) and Chen Mingxuan (2024).

Among the four dimensions, the module “Developing a dietary care plan for the elderly” showed the highest improvement rate, 65.19%. This substantial growth may be attributed to the problem-driven nature of PBL. By presenting authentic clinical scenarios—such as designing individualized dietary plans for elderly patients with hypertension and malnutrition—PBL encourages students to integrate theoretical knowledge of geriatric nutrition, physiology, and clinical nursing care. Through independent literature review, group discussion, and simulated care planning, students deepen both conceptual understanding and practical application. In contrast to traditional instruction that prioritizes memorization of textbook content, PBL transforms fragmented knowledge into structured problem-solving competence, thereby enhancing learning effectiveness. Ruiz-Montero et al. (2020) similarly reported that collaborative PBL significantly improves interdisciplinary knowledge integration and practical problem-solving performance compared with traditional teaching approaches.

The module “Common nutritional problems and dietary assessment for the elderly” also demonstrated a substantial improvement rate of 56.77%. This improvement may be explained by the integration of hands-on assessment tool practice (e.g., the MNA scale) and case-based analysis within the PBL framework. Students not only acquired theoretical knowledge but also practiced applying assessment tools in simulated clinical contexts. This experiential “learning-by-doing” approach compensates for the relatively weak theoretical foundation often observed among vocational students (Song Qian, 2021) and strengthens their ability to translate theoretical concepts into clinical practice. Similarly, Wang Xiaomei and Li Yemei (2021) found that PBL combined with clinical pathway teaching significantly improved students’ operational proficiency in geriatric assessment.

The improvements observed in the modules “Implementation and Evaluation of Dietary Care” (53.39%) and “Identification and Diagnosis of Diet-Related Problems” (50.78%) further demonstrate the comprehensive impact of PBL. By designing multidimensional clinical problems—such as identifying potential dietary risks and dynamically adjusting care plans based on evaluation outcomes, PBL stimulates active inquiry and promotes deeper cognitive engagement. Students transition from passive knowledge recipients to active problem solvers. This process aligns with constructivist learning theory, which emphasizes knowledge construction through independent inquiry and collaborative interaction. Li Fengxia et al. (2022) likewise reported that students exposed to PBL demonstrated significantly higher rates of active problem identification and more effective care plan adjustment compared with those receiving traditional instruction.

Overall, the multidimensional enhancement of learning achievement indicates that PBL is not limited to isolated skill development but represents a comprehensive instructional model applicable across the entire course system. By addressing core challenges in vocational nursing education—such as weak theory–practice integration, insufficient clinical operation skills, and passive learning habits—PBL systematically promotes knowledge mastery and skill acquisition. Ao et al. (2020) similarly confirmed that PBL in geriatric nursing education significantly improves theoretical understanding, practical application, and knowledge integration. The consistent effectiveness across modules in this study further supports the adaptability and scalability of PBL in vocational nursing curricula.

2. Clinical thinking ability of nursing students improved who have received problem-based learning were at a high level

After the PBL intervention, the critical thinking ability and systematic thinking ability of vocational nursing students reached a high level, and evidence-based thinking ability reached a medium level, with all sub-items showing high-level performance. This indicates that PBL effectively cultivates the three core dimensions of clinical thinking (critical, systematic, and

evidence-based thinking) as emphasized in the study, which is in line with the research findings of Liu Yue et al. (2016) that "clinical thinking ability is the core competitiveness of geriatric nursing professionals."

In terms of critical thinking, students' scores increased from 9.136 to 13.796. Significant gains were observed in sub-dimensions such as proactive questioning of dietary care issues and comparison between innovative and traditional care approaches. This improvement can be attributed to the design of open-ended and controversial clinical problems within PBL, such as exploring persistent malnutrition despite high-nutrition dietary interventions. Such scenarios encourage students to question assumptions, analyze root causes, and formulate independent judgments. Unlike traditional instruction, which often emphasizes standardized answers, PBL fosters an open academic environment that supports critical inquiry and rational analysis.

Systematic thinking ability also achieved remarkable results, with students' scores rising from 9.205 to 13.750. The sub-items "systematically collecting dietary-related information" and "identifying existing/potential dietary problems" performed particularly well. PBL requires students to comprehensively consider multi-dimensional factors affecting the elderly's diet, including physical conditions (such as dysphagia), psychological factors (such as food refusal), and social support (such as family care capabilities). In the process of formulating dietary care plans, students must follow the standardized process of "assessment → problem identification → plan formulation → effect evaluation," which helps them establish a holistic and procedural thinking framework. This effectively addresses the problem of fragmented knowledge and lack of systematic thinking among vocational college students, as pointed out by Zeng Lichang (2023).

Regarding evidence-based thinking, although the overall score reached a moderate level (10.295), individual sub-dimensions achieved relatively high performance. This suggests that students have acquired foundational evidence-based practice skills but require further development in comprehensive integration. Through guided retrieval of authoritative sources—such as the Chinese Dietary Guidelines for the Elderly (2022) and relevant clinical studies—students learned to support dietary care decisions with scientific evidence rather than relying solely on experiential judgment. The relatively moderate overall score may reflect the short duration of the intervention (eight weeks); longer-term PBL implementation may further strengthen students' ability to synthesize research evidence with clinical reasoning. (Chinese Nutrition Society, 2022)

In summary, the enhancement of clinical thinking ability can be attributed to the intrinsic characteristics of PBL. Problem-driven learning stimulates critical inquiry, collaborative discussion fosters systematic reasoning, and evidence-based tasks cultivate scientific decision-making skills. This multidimensional instructional approach effectively addresses the key challenges in developing clinical thinking among vocational nursing students and prepares them to manage the complexity of geriatric nursing practice.

7. Suggestions

1. Suggestions for implementation

1.1 Vocational nursing educators should systematically adopt problem-based learning methods, integrating authentic elderly dietary care cases (e.g., malnutrition intervention for bedridden elderly and dietary adjustment for elderly with diabetes and hypertension) to stimulate student interest, clinical reasoning, and active engagement. Cases should reflect the complexity of real-world geriatric care, such as multi-disease coexistence and psychological factors affecting dietary compliance.

1.2 Vocational nursing curriculum planners must provide specialized teacher training to equip educators with the ability to design contextually appropriate PBL cases and effectively

guide elderly dietary care problem-solving processes. Training should focus on integrating clinical geriatric nursing experience into teaching; mastering PBL implementation steps (preparation and group division, problem selection and question raising, etc.); and using professional tools such as MNA scales and dietary assessment templates.

1.3 During problem-based implementation, educators should adhere to detailed project steps—Preparation and Group Division, Problem Selection and Question Raising, Independent Inquiry and Group Discussion, Case Diagnosis and Plan Formulation, and Evaluation and Summary—to ensure students' learning is progressive and cyclical. Continuous monitoring and timely feedback throughout each phase are essential, particularly in guiding students to connect theoretical knowledge (e.g., nutritional requirements for the elderly) with practical scenarios (e.g., formulating weekly dietary plans for disabled elderly).

1.4 Collaboration with geriatric care institutions (e.g., nursing homes, community health centers) should be expanded. Inviting clinical geriatric nurses, nutritionists, or elderly caregivers to participate in case reviews, simulate family consultations, or evaluate student care plans will enhance the real-world relevance of PBL and deepen students' professional awareness of elderly dietary care.

2. Suggestions for future research

2.1 Future research should explore the long-term impact of problem-based learning on students' job performance, internship outcomes, and clinical competency retention in the geriatric nursing field, particularly in real elderly care settings such as nursing homes or community health services.

2.2 Comparative studies between different instructional models (e.g., problem-based learning vs. traditional lecture-based learning) can further validate PBL's effectiveness in enhancing specific clinical thinking dimensions—such as evidence-based thinking in elderly dietary plan design or systematic thinking in nutritional risk assessment—across various domains of geriatric nursing education.

2.3 Studies with a larger sample size and longer intervention periods (e.g., a full academic year) could provide deeper insights into how problem-based learning influences the development of advanced clinical thinking skills, such as complex case management (e.g., dietary care for elderly with multi-disease coexistence) or ethical decision-making (e.g., balancing nutritional needs with elderly patients' autonomy).

2.4 Future studies may consider the integration of interdisciplinary elements (e.g., geriatric psychology, social work, nutritional science) into PBL frameworks to assess holistic professional development among vocational nursing students, aligning with the comprehensive competency requirements of modern geriatric care.

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