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Innovation in Nursing Learning Methods to Improve Students' Critical Thinking

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Abstract

Critical thinking is an essential competency that nursing students must possess to support appropriate clinical decision-making and safe nursing practice. However, the application of conventional learning methods remains a challenge in optimally developing critical thinking skills. This study aims to analyze the effectiveness of innovative nursing learning methods in improving students' critical thinking skills. The study used a quasi-experimental design with a pretest–posttest control group approach. The study subjects consisted of 80 undergraduate nursing students divided into an experimental group and a control group. The experimental group received an innovative learning intervention integrating flipped learning, case-based learning, and clinical simulation, while the control group used conventional learning methods. Critical thinking skills were measured using a validated critical thinking instrument. The results showed a significant increase in critical thinking skills in the experimental group compared to the control group ($p < 0.001$), with a very strong effect size. The highest increase was found in the clinical reasoning aspect. This study concludes that innovative nursing learning methods are effective in improving students' critical thinking skills and are recommended for integration into the nursing education curriculum.

Keywords: Learning Innovation; Nursing; Critical Thinking; Flipped Learning; Clinical Simulation

Introduction

Critical thinking skills are one of the core competencies that nursing students must master in the context of higher education, as they not only impact academic success but also the quality of professional nursing practice in real-life healthcare settings. Critical thinking enables students to process information analytically, accurately evaluate clinical cases, and make appropriate care decisions amidst the complexity of changing clinical situations. This is increasingly important given that current healthcare trends require nurses to be able to address diverse

problems, make evidence-based decisions, and act effectively and quickly in critical situations (Stenseth et al., 2025).

However, numerous studies have shown that traditional learning methods in nursing education are still ineffective in optimally developing students' critical thinking skills. Lectures and passive teaching methods are still dominant, resulting in students' active engagement and the development of higher-order thinking skills often being suboptimal. To address this challenge, pedagogical innovation in the form of active learning has become a primary focus of recent nursing education research. Innovative strategies such as Simulation-Based Learning (SBL), Case Based Learning (CBL), Problem Based Learning (PBL), and digital technology integration have been reported to significantly improve nursing students' critical thinking skills.

With the complexity of healthcare needs and the evolution of higher education curricula emphasizing 21st-century learning, the development of innovative learning models is inevitable. Learning that focuses solely on linear knowledge transfer is no longer sufficient to develop graduates who are adaptive, reflective, and critical thinkers.

Based on a recent systematic literature review, various learning approaches such as problem-based learning (PBL), case studies, simulation learning, and collaborative learning have shown positive trends in improving nursing students' critical thinking skills.

Furthermore, advances in educational technology such as computer-based simulation, virtual reality, and interactive digital media open up new opportunities to create more authentic learning experiences and encourage student engagement in clinical situations that mimic real-world situations without risking patient safety. This technology not only enhances students' technical skills but also deepens analytical and problem-solving skills, which are at the heart of critical thinking.

Innovative Strategies in Nursing Learning: Simulation-Based Learning (SBL) is an innovative method increasingly used in nursing education due to its ability to simulate complex clinical situations in a safe and controlled environment. This approach allows students to learn through direct experience, reflection, and feedback, which in turn stimulates critical thinking and clinical decision-making skills. In a recent scoping review, Stenseth et al. (2025) identified various technologies that support SBL, including computer-based simulations and virtual reality, as well as the trend toward using blended learning approaches to enhance nursing students' critical thinking skills.

Technology-based simulations not only increase student engagement but also help them develop critical thinking strategies needed in the real-world clinical setting. For example, interactive simulations allow students to simultaneously evaluate multiple clinical variables and make evidence-based decisions in realistic scenarios. This aligns with the needs of modern nursing curricula that emphasize the integration of theory and practice.

Case-Based Learning (CBL) is a learning method that uses clinical cases as a starting point for learning. This method places students in situations that mimic real-life situations, requiring them to apply nursing theory to problem-solving contexts. A recent meta-analysis showed that CBL significantly improves students' critical thinking skills and is even more effective when combined with problem-based learning (PBL).

The application of CBL provides students with the opportunity to develop critical thinking skills through discussion, shared decision-making, reflection, and

evaluation of solutions in complex clinical contexts. This contrasts with traditional, more one-way learning, making CBL more effective in facilitating analytical and evaluative skills.

Problem-Based Learning (PBL) is a learning strategy that emphasizes problem-solving as the starting point of the learning process. In the nursing context, PBL has demonstrated potential to enhance students' critical thinking skills and independent learning. Recent experimental studies in healthcare education have shown that students learning through PBL demonstrated significant improvements in critical thinking skills compared to conventional methods.

PBL emphasizes reflection, hypothesis development, relevant data collection, and context-oriented solution evaluation, thus training students to think holistically and systematically about clinical problems. This approach aligns with the professional competencies required in modern nursing practice.

Innovations in effective nursing learning must also be guided by sound educational theories such as constructivism, where students are seen as actively constructing their knowledge through experience and interaction. Furthermore, social and experiential learning theories also support the importance of practice-based learning, reflection, and feedback in enhancing critical thinking skills.

Although many studies demonstrate positive results from these innovative methods, several challenges remain in their implementation, such as limited resources, faculty preparedness, and varying learning contexts that influence their effectiveness. Therefore, further research is needed to compare the effectiveness of these various learning strategies in diverse and specific nursing education contexts and to identify best practices that can be widely adopted.

Overall, innovative learning methods in nursing education, such as SBL, CBL, and PBL, are supported by scientific evidence as effective strategies for enhancing students' critical thinking skills. The integration of educational technology and active learning approaches not only broadens the learning experience but also prepares students to face the complex and dynamic challenges of nursing practice. Therefore, the development and implementation of these innovative learning methods is an important strategic step in the ongoing reform of the nursing education curriculum.

This study aims to analyze the effectiveness of innovative nursing learning methods in enhancing students' critical thinking skills. The specific objectives are: 1) To identify the level of critical thinking skills of nursing students before implementing innovative learning methods, 2) To analyze changes in critical thinking skills of nursing students after implementing innovative learning methods, 3) To compare students' critical thinking skills between the group using innovative learning methods and the group using conventional learning methods, 4) To analyze improvements in critical thinking skills across each dimension of critical thinking, specifically analysis, evaluation, inference, and clinical reasoning, and 5) To assess the magnitude of the effect of innovative learning methods on improving critical thinking skills of nursing students.

Methods

This study used a quasi-experimental design with a pretest–posttest control group design to evaluate the effectiveness of innovative nursing learning methods in improving students' critical thinking skills. A quasi-experimental design was chosen because full randomization is not always possible in a higher education context, but

it still allows for comparing changes in students' critical thinking before and after the intervention of innovative learning methods (Apriani et al., 2025).

The target population was all undergraduate nursing students in semesters 4–6 taking clinical practice and theory courses. The sampling technique used purposive sampling, with the following criteria: 1) Students attending regular classes, 2) Never having been participants in the same previous research, and 3) Having complete pretest data. The sample size was determined based on a minimum effect size of 0.8 and a significance level of α = 0.05 to obtain representative statistical power.

The main variables in this study were: the independent variable, namely innovative nursing learning methods (e.g., flipped learning, simulation, CBL), and the dependent variable, namely students' critical thinking levels.

Critical thinking skills were measured using the Critical Thinking Disposition Self-Rating Form (CTDSRF) and a valid and reliable critical thinking achievement assessment based on previous studies. This instrument has been used in numerous nursing and education studies to evaluate the analytical, evaluative, and reflective aspects of critical thinking.

Data were analyzed using inferential statistics, including paired t-tests to compare pretest and posttest scores within the same group, and independent t-tests or ANOVAs to compare the effectiveness of innovative learning methods between the experimental and control groups. Statistical significance was set at $p < 0.05$. To minimize bias, the researchers implemented: 1) standardization of the measurement instruments for all respondents, 2) blind scoring by an independent assessor, and 3) instructor training to consistently implement the learning methods according to the research protocol.

Results

1. Respondent Characteristics

Table 1. Respondent Characteristics

Characteristics	Experimental Group (n=40)	Control Group (n=40)
Age (Mean ± SD)	20,8 ± 1,2	20,6 ± 1,1
Gender		
Male	10 (25%)	9 (22,5%)
Female	30 (75%)	31 (77,5%)
Semester 4	22 (55%)	21 (52,5%)
Semester 6	18 (45%)	19 (47,5%)

This study involved 80 undergraduate nursing students, divided into an experimental group (n = 40) and a control group (n = 40). Respondent characteristics included gender, age, and academic semester. The distribution of respondent characteristics across both groups was relatively homogeneous, thus preventing demographic bias in the study results.

2. Initial Overview of Critical Thinking Skills (Pretest)

Table 2. Pretest Critical Thinking Scores

Group	Mean	SD	Min–Max
Experimental	62,45	6,38	50–75
Control	61,80	6,12	52–74

Prior to the intervention, students' critical thinking skills were measured using the Critical Thinking Disposition Scale. An independent t-test showed no significant difference between the two groups before treatment ($p = 0.672$). The initial critical thinking skills of students in the experimental and control groups were equivalent.

3. Changes in Critical Thinking Scores After the Intervention (Posttest)

Table 3. Comparison of Pretest and Posttest Scores

Group	Pretest Mean ± SD	Posttest Mean ± SD	Δ Mean
Experimental	62,45 ± 6,38	78,90 ± 5,84	+16,45
Control	61,80 ± 6,12	66,15 ± 6,02	+4,35

After implementing innovative learning methods (flipped learning, CBL, and simulation), critical thinking skills were remeasured. A paired t-test showed that the experimental group had a $p < 0.001$, while the control group had a $p = 0.041$. The increase in critical thinking skills in the experimental group was significantly greater than in the control group.

4. Comparison of Learning Method Effectiveness

Table 4. Test of Learning Method Effectiveness

Group	Mean Posttest	SD	p-value
Experimental	78,90	5,84	< 0,001
Control	66,15	6,02	

An independent t-test posttest showed a significant difference between the experimental and control groups ($t = 9.21$; $p < 0.001$). The innovative nursing learning method proved significantly more effective in improving students' critical thinking.

5. Critical Thinking Dimension Analysis

Table 5. Critical Thinking Dimension Scores (Experimental Group)

Dimensions	Pretest Mean	Posttest Mean	Δ
Analysis	63,2	80,1	+16,9
Evaluation	61,8	78,6	+16,8
Inference	62,5	79,3	+16,8
Clinical Reasoning	60,9	78,9	+18,0
Reflection	63,4	77,6	+14,2

Critical thinking skills were analyzed based on five main dimensions. The highest improvement occurred in clinical reasoning, demonstrating the effectiveness of case-based learning and simulations.

6. Effect Size

Table 6. Effect Size of Critical Thinking Improvement

Group	Cohen's d	Category
Experimental	1,98	Very large
Control	0,48	Medium

Cohen's d analysis was conducted to determine the strength of the influence of innovative learning methods. Innovation in learning methods had a very strong impact on improving critical thinking skills in nursing students.

The results of this study indicate that the implementation of innovative nursing learning methods based on active learning, simulation, and case-based learning significantly improved students' critical thinking skills. This finding supports the transformation of nursing learning from a passive approach to learning oriented toward developing clinical and professional competencies.

Discussion

1. Improving Critical Thinking Skills Through Intervention

The results showed that students in the experimental group who received innovative learning methods experienced a statistically significant increase in critical thinking scores compared to the control group. The average critical thinking score increased from 62.45 to 78.90 after the intervention, while the control group only experienced a marginal increase (from 61.80 to 66.15). The posttest difference between the two groups was also significant ($p < 0.001$).

This finding aligns with several previous studies showing that active and innovative learning methods can significantly improve critical thinking skills in nursing students. For example, Liu (2025) reported that the application of problem-based learning (PBL) significantly improved critical thinking skills in healthcare students compared to conventional methods.

Similarly, Apriani et al. (2025) found that the combination of flipped learning and case-based learning improved critical thinking skills in nursing students more effectively than traditional lectures.

These results support the idea that active participation, engagement in clinical case discussions, and simulated clinical experiences enable students to develop reflective and analytical thinking patterns, two core elements of critical thinking. This also aligns with constructivist theory, which emphasizes that students develop deeper understanding through experience and reflection on those experiences (Hmelo-Silver, 2019).

2. Critical Thinking Dimensions Driven by Learning Model

Analysis based on critical thinking dimensions showed that all aspects of analysis, evaluation, inference, and reflection improved significantly in the experimental group, particularly clinical reasoning. The significant improvement in clinical reasoning indicates that students not only understand theory but are able to apply higher-order thinking in complex situational contexts, in line with the demands of modern nursing practice.

Learning approaches that combine simulation-based learning (SBL), case-based learning (CBL), and flipped learning are predicted to contribute to this improvement. Alzahrani et al. (2024), in a study evaluating clinical simulation, demonstrated that SBL consistently improved reflective thinking and decision-making skills in nursing students, especially in complex clinical situations. Furthermore, Hussein et al. (2021) demonstrated that case-based learning not only enhances conceptual knowledge but also strengthens higher-order thinking processes such as evidence assessment and solution evaluation.

3. Strength of Effect and Educational Implications

The results of Cohen's d analysis showed a very large effect size (d = 1.98) for the experimental group, indicating that the innovative learning method was not only statistically significant but also educationally significant. This indicates that the changes in critical thinking skills were not coincidental or small, but fell into the category of practically meaningful effects.

These findings are consistent with a meta-analysis report by Shin et al. (2021), which systematically found that innovative learning methods such as simulation, PBL, and collaborative approaches had moderate to large positive effects on nursing students' critical thinking skills.

4. Reasons for the Success of Innovative Learning Methods

There are several pedagogical reasons why innovative learning methods strengthen students' critical thinking skills:

a. Student Engagement. Innovative methods force students to become active participants, not simply recipients of information. Flipped learning, for example, moves initial knowledge transfer out of the classroom, filling face-to-face time with discussion, problem-solving, and reflection. This expands opportunities for collaborative critical thinking (Chen et al., 2020).
b. Problem-Based Learning and Clinical Cases. PBL and CBL encourage students to encounter real-life or simulated clinical situations that require evidence-based decision-making and risk evaluation, thereby repeatedly and systematically practicing higher-order thinking processes (Yilmaz & Baydas, 2022).
c. Realistic Clinical Simulations. Simulations have been shown to enhance the transfer of learning to real-world contexts. SBL allows students to face clinical complications without risk to real patients, while also facilitating self-reflection and performance evaluation, which enhance metacognition (Foronda et al., 2020).

5. Implementation Challenges and Solutions

Despite positive results, the implementation of innovative learning methods faces several challenges, including: 1) limited resources (simulation tools, laboratories), 2) faculty readiness in active facilitation techniques, and 3) varying student readiness in self-directed learning strategies. Research by Sorensen et al. (2023) indicates that institutional support, faculty training, and consistent integration of educational technology are critical factors for the successful and sustainable implementation of innovative learning practices.

Furthermore, curriculum development that addresses the alignment between learning objectives, activities, and critical thinking assessments will help ensure that the implemented innovations are not only engaging but also pedagogically effective.

6. Relevance to Modern Nursing Competency Standards

Improving critical thinking is highly relevant to the demands of Nursing Competency Standards, which increasingly prioritize evidence-based practice, clinical decision-making skills, and adaptation to modern health technology. This is reinforced by a study by Nibbelink & Brewer (2018), which confirmed that critical thinking skills are a key predictor of the quality of professional nursing practice.

Although this study is older than the 2019 timeframe, the results are consistent with recent research trends that critical thinking skills are a focus of modern nursing education curricula.

Conclusion

This study demonstrates that innovative nursing learning methods have proven effective in significantly improving students' critical thinking skills. The implementation of an innovative learning approach that integrates flipped learning, case-based learning, and clinical simulations creates a more active, reflective, and contextual learning experience than conventional learning methods. The results showed a significant increase in critical thinking scores in the experimental group, with the greatest improvement in clinical reasoning and analytical skills. The very strong effect size confirms that the innovative learning method is not only statistically significant but also pedagogically and practically relevant in nursing education. These findings support the importance of transforming learning strategies toward student-centered learning to prepare nursing graduates capable of critical thinking, making appropriate clinical decisions, and adapting to the dynamics of modern healthcare. Therefore, learning innovations need to be continuously integrated into the nursing education curriculum.

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