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Development of a Learning Activity Package Using Case-Based Learning Combined with Brainstorming Technique to Enhance Critical Reflection Among Nursing Students

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Abstract

The objectives of this research and development study were to: 1) develop a learning activity package using case-based learning combined with a brainstorming technique at the 80/80 criterion standard; and 2) compare the ability of nursing students to reflect critically before and after using the LAP. The sample consisted of 36 third-year students enrolled in the Bachelor of Nursing Science program at Rajamangala University of Technology Thanyaburi, selected through a multi-stage random sampling. The research instruments consisted of the LAP and a critical reflection assessment tool. The data were analyzed using means, standard deviations, E1E2, and dependent t-tests. The result of the study found that: 1) The Learning Activity Package consisted of ten components: activity title, introduction, instructions, learning objectives, implementation guidelines, learning activities, evaluation methods, instructional design plan, learning activity worksheets, and assessment instruments, with an effectiveness of 88.88/91.85. The quality of the learning activity package was evaluated by three experts, with item-objective congruence (IOC) values ranging from 0.66 to 1.00, indicating acceptable content validity. and 2) nursing students' critical reflection after using the LAP was higher than before learning at the statistical significance level of .05. This LAP may contribute to the development of critical reflection among nursing students.

Keywords: Brainstorming Technique, Case-Based Learning, Critical Reflection, Learning Activity Package and Nursing Students

Introduction

Rapid global change, especially digital disruption driven by technological innovation, has reshaped economic, social, cultural, and healthcare landscapes. Medical progress has brought longer lifespans and better treatments, but it has also complicated patient expectations and satisfaction levels (Inchaithep, 2019). Consequently, the nursing profession must evolve to care for patients with diverse cultural backgrounds, complex health needs, and emerging diseases (Khorphon et al., 2019). Thailand Nursing and Midwifery Council (2019) emphasizes that the nursing process should be based on the appropriate use of evidence-based information within the framework of professional ethics. Nurses must therefore develop strong analytical and critical reflection skills to make sound clinical decisions, solve problems effectively, and keep patients safe.

Nursing education programs now confront the challenge of preparing graduates to respond to shifting social and healthcare landscapes while sustaining high standards of care and patient safety (Fawaz et al., 2018). Therefore, 21st-century education focuses on student-centered learning, promoting learning through practical application, and integrating knowledge to solve real-world problems (Pantaewan, 2016). This concept aligns with the 2017 Bachelor of Nursing Qualifications Standards, which define intellectual skills as a key learning outcome, requiring students to think analytically and systematically and use experience as a basis for decision-making (Ministry of Education, 2017). These abilities depend on reflective thinking for sound decision-making (Edwards, 2017).

Critical reflection is grounded in transformative learning theory, which explains how learners transform their frames of reference by critically examining socio-culturally shaped assumptions (Mezirow, 1998; Mezirow, 2000). It involves questioning beliefs and values that influence professional judgment and reconstructing meaning through rational dialogue (Mezirow, 1998; Ng et al., 2020). In nursing education, this extends beyond technical reasoning toward deeper examination of assumptions and structural influences in practice (Edelist et al., 2024; Peterson et al., 2023). However, nursing students often demonstrate limited reflection skills. They tend to reason at a technical level, focusing on describing events and addressing immediate problems (Wichainate, 2014). Meanwhile, critical reflection-which examines the norms, assumptions, and power structures in professional practice-receives insufficient attention in curricula (Edelist et al., 2024; Ng et al., 2020).

Poor critical reflection abilities can prevent nursing students from seeing social biases or inequalities embedded in healthcare (Peterson et al., 2023). Critical reflection is vital precisely because it pushes learners to examine what shapes their thinking and actions, opening the door to genuine perspective transformation (Mezirow, 1998).

Developing these critical thinking skills requires learning approaches that push students to question norms, challenge established ideas, and understand how social contexts influence professional practice. Case studies offer a way to connect theory with practice (Alnaim, 2015), but they're often misused. Instead of exploring complexity and ambiguity, instructors treat them as exercises in finding the "right" answer. When appropriately designed,

case-based learning situates learning in authentic clinical contexts, requiring students to analyze complex situations and justify decisions using theoretical and empirical evidence (Alnaim, 2015; Brooks et al., 2010). Effective case analysis moves beyond identifying correct answers by encouraging comparison of perspectives, ethical evaluation, and critical examination of underlying assumptions (Ng et al., 2020; Edelist et al., 2024). Thus, it supports progression from technical rationality to higher levels of reflective judgment (Zeichner & Liston, 1987).

Understanding a case study therefore requires evidence from multiple sources and enables students to explore real-life phenomena within authentic contexts (Brooks et al., 2010). Adding techniques like brainstorming could deepen learning and encourage critical thinking (Chansuvarn et al., 2024). Appropriately designed case-based learning situates students in authentic clinical contexts, requiring analysis of complex situations and justification of decisions using theoretical and empirical evidence (Alnaim, 2015; Brooks et al., 2010). It extends beyond correct answers by promoting perspective comparison, ethical evaluation, and critical examination of assumptions (Ng et al., 2020; Edelist et al., 2024), thereby advancing learners from technical rationality toward higher reflective judgment (Zeichner & Liston, 1987).

In the dimension of educational innovation, it was found that the development of systematically designed learning activities to promote critical reflection is limited. Research shows that well-structured learning activity packages with clear steps and objectives can develop learners' abilities and support complex learning outcomes (Thamrongsotthisakul, 2017). Combining case-based learning with brainstorming in structured activity sets offers a promising solution-one that promotes flexible thinking, generates diverse alternatives, and encourages deeper learning (Laolearndee et al., 2017). This approach fits well with transformative learning theory, which values collaborative learning, multiple perspectives, and holistic thinking (Panich, 2015; Mezirow, 2000).

Although structured learning activity packages have been shown to enhance learners' abilities and support complex outcomes (Thamrongsotthisakul, 2017; Laolearndee et al., 2017), limited empirical evidence examines whether integrating case-based learning and brainstorming effectively enhances critical reflection among nursing students. Prior research has focused primarily on general achievement rather than higher-level reflective judgment (Ng et al., 2020; Edelist et al., 2024). Thus, a clear gap remains regarding the effectiveness of an integrated learning activity package in promoting critical reflection in nursing education.

Preparing nursing graduates for the country's healthcare system requires more than just technical training—it demands that we help students develop their intellectual abilities. Students need to move beyond basic analytical thinking toward critical reflection, where they examine the underlying assumptions, beliefs, and values that shape professional practice (Jermtaisong and Thongthew, 2013).

For these reasons, developing an innovative teaching approach that integrates case-based learning with brainstorming is a strategic means of promoting critical reflection among nursing students. The findings are expected to provide empirical support for evidence-based educational development and may contribute to improving nursing care quality and patient safety within increasingly complex healthcare systems.

Research Objectives

1. To develop a learning activity package that combines case-based learning with brainstorming techniques to strengthen critical reflection in nursing students at the 80/80 criterion standard.

2. To compare nursing students' critical reflection abilities before and after completing the learning activity package combined case-based learning with brainstorming techniques.

Research Conceptual Framework

This research followed a Research and Development (R&D) framework that integrated three key dimensions of critical reflection across four main phases (Phases 1–4). This lays the foundation for developing educational innovations that link theory to practice concretely and lead to sustainable behavioral and intellectual changes among learners.

Learning activity package innovation began in Phase 1: Analysis. This involved reviewing relevant literature, research findings, and real-world needs, as well as gathering expert opinions to ensure the innovation fitted the nursing learning environment and interdisciplinary work. The innovation was further developed in Phase 2: Design and Development. This phase built on Brahmawong (2013) teaching innovation framework. The combination of case-based learning strategies (Choi and Lee, 2009) with Osborn (1957) brainstorming technique created a safe learning environment where students felt free to express their ideas. The activity sets were tested for content validity (Index of Content Validity: IOC) by three experts before being used in Phase 3. During implementation, these activities helped students develop their thinking skills in a step-by-step manner.

The cognitive process drives internal transformation grounded in Zeichner and Liston (1987) framework. Students' progress from technical rationality, applying theory to standards, to reflectivity, questioning assumptions and contexts. Ultimately, they attain critical reflection, the highest level, by critically examining power structures and biases to connect practice with deeper ethical considerations (Edelist et al., 2024; Peterson et al., 2023).

The final learning outcome in Phase 4, Evaluation, this involved assessing the innovation's effectiveness using the E1/E2 criteria and comparing students' skill development before and after the intervention. The critical reflection process led to what Mezirow (2000) and Panich (2015) call Transformative Learning—a shift in students' worldviews and personal meaning-making systems.

This research framework reflects the systemic relationship between learning management innovation, which has undergone intensive research and development, cognitive theories, and transformative learning. The main goal was to help nursing students at Rajamangala University of Technology Thanyaburi develop their critical reflection skills. In addition, the students were also to handle the complexities of healthcare, make sound clinical decisions, and deal with ethical challenges in ways that keep patients safe and satisfied (see Figure 1)

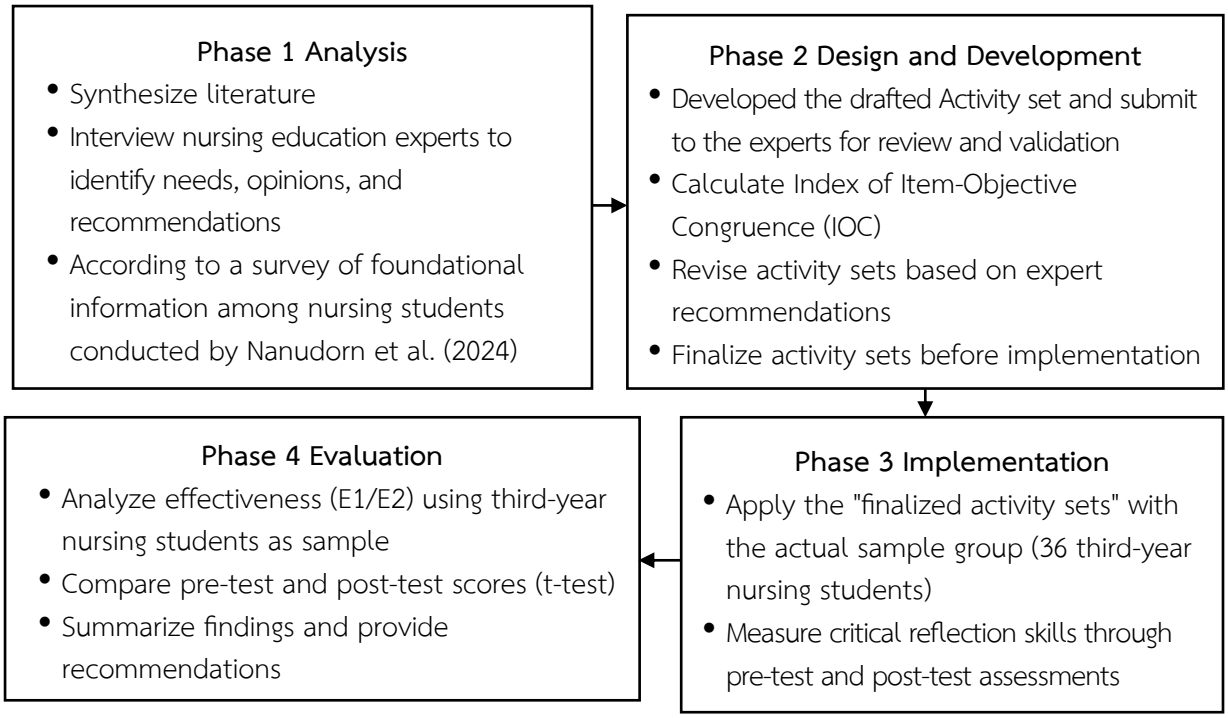


Figure 1 The diagram illustrates a research framework based on the integration of Research and Development (R&D)

Research Methodology

This Research and Development of innovation was conducted using the Research and Development (R&D) process, divided into four phases to achieve a high-quality and effective learning management innovation that aligns with academic principles. These are detailed as follow:

Phase 1 Analysis: This initial phase analyzed foundational data to establish the conceptual framework and direction of innovation development. Relevant theories and research on critical reflection were reviewed, along with the 2017 Bachelor of Nursing Science Qualification Standards and the curriculum at Rajamangala University of Technology Thanyaburi to guide 21st-century competency development. Five nursing lecturers and curriculum experts were purposively selected based on having more than 10 years of teaching experience. Face-to-face interviews were conducted to explore their needs, opinions, and recommendations regarding essential learning activities. Content analysis indicated the need to integrate case-based learning and brainstorming to enhance critical reflection, particularly in nursing ethics and assessment. Critical reflection levels were then surveyed among 294 nursing students, with 169 selected using the Krejcie and Morgan (1970) table to inform the learning activity design. The instruments included a needs assessment questionnaire and a critical reflection scale, validated by five experts (IOC = 0.80–1.00 and 0.96–1.00, respectively). The reliability coefficient of the critical reflection scale was .928. (Nanudorn et al., 2024).

This Research and Development of innovation was conducted using the Research and Development (R&D) process, divided into four phases to achieve a high-quality and effective learning management innovation that aligns with academic principles. These are detailed as follow:

Phase 2 Design and Development: This phase aimed to design and develop a Learning Activity Package consisting of ten components: 1) activity title, 2) introduction, 3) instructions, 4) learning objectives, 5) implementation guidelines, 6) learning activities, 7) evaluation methods, 8) instructional design plan, 9) learning activity worksheets, and 10) assessment instruments. The package comprised a set of learning activities integrating three key concepts: (1) the structure of learning activities based on the concepts of Brahmawong (2002) and Sutthirat (2018); (2) case-based learning management based on the concepts of Choi and Lee (2009); and (3) brainstorming techniques based on the concepts of Osborn (1957). The development process began with defining the conceptual framework and drafting a set of learning activities, designing activities in five steps: 1) sparking ideas and identifying problems; 2) collaborative analysis and grouping ideas; 3) proposing solutions through brainstorming; 4) connecting knowledge and making joint decisions; and 5) reflecting on results and synthesizing ideas. The developed set of activities included a user manual and five lesson plans, totaling 20 hours. These activities were conducted outside regular class hours through online classrooms via Microsoft Teams, where students could access content review materials and participate in breakout room sessions for small group brainstorming discussions on case studies.

The set of activities was validated for content consistency by three experts, with content validity index values ranging from 0.66-1.0. The revision recommendations focused on language usage in case studies, particularly clinical terminology and the complexity level of cases involving disease complications. Indicators were defined based on Zeichner and Liston's (1987) three levels of reflective thinking: Technical Rationality, Reflectivity, and Critical Reflection. The assessment had a content validity index of 0.66-1.0 and a reliability coefficient of 0.82 in a pilot study involving 30 students.

Phase 3 Implementation: This phase involved testing the developed innovation with a target group using a quasi-experimental research design, specifically a one-group pretest-posttest design. The research sample consisted of 36 third-year nursing students from Rajamangala University of Technology Thanyaburi, selected through a multistage sampling process. The selection focused on the year level with the lowest average critical reflection level, and convenience sampling was used to select participants based on their voluntary participation. The experiment started with a pre-assessment and a review of basic nursing ethics. Students then worked through five learning units over five weeks (four hours per week, 20 hours total) using Microsoft Teams. A post-assessment would be on the final day.

Phase 4 Evaluation: The final stage involved data analysis to evaluate the effectiveness of the LAP in three areas: 1) The effectiveness of the Learning Activity Package (LAP) was determined according to the 80/80 efficiency criterion proposed by Brahmawong (2002). In this framework, E1 refers to the process efficiency, calculated as the mean percentage score obtained by students during learning activities and formative assessments (e.g., midterm or in-class tasks), reflecting the quality of learning implementation. E2 refers to the outcome efficiency, calculated as the mean percentage score on the post-test after completing the instructional package, reflecting learning achievement. The 80/80 criterion indicates that both the process and outcome scores should reach at least 80 percent. The obtained E1/E2 values were compared against this benchmark to determine whether the developed LAP met the established instructional efficiency standard. These results were used as evidence to confirm that the LAP was effective and appropriate for promoting higher-level thinking skills, particularly critical reflection, among nursing students; and 2) comparing the difference in average pre-test and post-test scores using a t-test for Dependent Samples at a statistical significance level of .05.

The research has been reviewed and approved by the Human Research Ethics Committee, Rajamangala University of Technology Thanyaburi, under the reference number RMUTT_REC No. Exp 57/64.

Research Findings

This finding of data analysis results from the development of a LAP using case-based learning combined with brainstorming techniques to promote critical reflection among Bachelor of Nursing students at Rajamangala University of Technology Thanyaburi was conducted in accordance with a four-phase research and development process:

Phase 1 Analysis: An analysis of the Bachelor of Nursing Qualification Standards 2017 and the Bachelor of Nursing Curriculum 2018 revealed that the desired graduate attributes emphasize the ability to think systematically and critically and to use scientific processes to solve health problems, especially intellectual skills focusing on searching, analyzing, and applying evidence-based data (Ministry of Education, 2017). Modern nursing requires exactly this kind of work—bringing together knowledge and practice in ways that rest on solid evidence and ethical principles, as the Thailand Nursing and Midwifery Council (2019) has emphasized. However, an analysis of the current situation and related documents showed that most nursing students' reflective thinking remains at a superficial level. Furthermore, it has not yet led to a true critical reflection paradigm shift (Panich, 2015).

Interviews with five nursing lecturers and curriculum experts consistently highlighted the urgent need to develop learning activities that emphasize in-depth thinking processes rather than the rote memorization of theories. They suggested using realistic, complex case studies that incorporate ethical dilemmas or do not present a single correct answer to encourage students to weigh options under realistic pressure. Another recommendation was to let students jot down their thoughts before group discussions. This gives quieter students

a chance to contribute without being drowned out by more confident voices. The instructor's job becomes asking the right questions and debriefing carefully to push students' thinking further.

The quantitative data from surveying 169 nursing students about their critical reflection abilities. Overall, students scored at high levels. However, when considering each year individually, third-year students had the lowest average scores compared to other years, particularly when compared to fourth-year students (Nanudorn et al., 2024). These findings suggest that third-year students, who are just starting to work with complex clinical situations, tend to stick with surface-level technical reflection or simply follow procedures. This made them the obvious choice for testing the innovation in the next phase.

Phase 2 Design and Development: The developed LAP comprises five learning units: ethical theory, ethical principles in practice, ethical concepts, professional ethics, and patient rights. The learning activities utilize case-based learning combined with brainstorming techniques, structured in five steps based on the concepts of Choi and Lee (2009) and Osborn (1957): 1) sparking ideas and identifying problems; 2) collaborative analysis and grouping of ideas; 3) proposing solutions through brainstorming; 4) connecting knowledge and making joint decisions; and 5) reflecting on results and synthesizing ideas. This structure is designed to promote the development of reflective thinking from technical rationality to critical reflection in accordance with Zeichner and Liston (1987) framework.

Phase 3 Implementation: A 20-hour trial of the LAP with 36 third-year nursing students revealed that the learning atmosphere created by the learning activity package delivered through Microsoft Teams effectively fostered student participation. Students demonstrated enthusiasm in exchanging ideas, successfully applied nursing ethics principles to analyze complex case studies from multiple perspectives, and showed significant development in reasoning abilities and critical questioning skills. The instructor functioned as a facilitator, encouraging students to engage in deeper reflection.

Phase 4 Evaluation: The results of the evaluation of the effectiveness of the learning activity set revealed the following key conclusions as follows:

1. Quality of the Learning Activity Package

The developed Learning Activity Package (LAP) comprised ten components: 1) activity title, 2) introduction, 3) instructions, 4) learning objectives, 5) implementation guidelines, 6) learning activities, 7) evaluation methods, 8) instructional design plan, 9) learning activity worksheets, and 10) assessment instruments. The quality of the LAP was evaluated by three experts in nursing education and instructional design. The content validity assessment yielded item–objective congruence (IOC) values ranging from 0.66 to 1.00, indicating acceptable alignment between objectives and activity components.

The learning activities were evaluated against the 80/80 efficiency criteria. This criterion examines both process efficiency (E1) and outcome efficiency (E2). The analysis results appear in Table 1.

Table 1 Effectiveness of the learning activity set (E1/E2)

Effectiveness	Maximum point	Sum	$\overline{x}$	Percent
The Effectiveness of the process (E1)	50	1600	44.44	88.88
The effectiveness of the product (E2)	30	992	27.55	91.85

The analysis of the LAP effectiveness revealed that the process effectiveness (E1) was 88.88 and the outcome effectiveness (E2) was 91.85, both exceeding the standard of 80/80. This demonstrates that the developed LAP is effective in both the learning process and the outcomes achieved by the learners.

2. Comparison of Nursing Students' Critical Reflection Levels Before and After the Intervention

Critical reflection is fundamental to nursing practice. It underpins clinical reasoning and professional judgment. To evaluate the learning activities, students' critical reflection levels were compared before and after the intervention across three areas: technical reasoning, reflective thinking, and overall critical reflection. Data were analyzed through a t-test for Dependent Samples as presented in Table 2. Paired t-tests revealed significantly higher post-test scores across all domains (p = .001). Overall critical reflection increased from 81.42 to 88.42 (t = 9.94), demonstrating substantial cognitive development following the intervention.

Table 2 Comparison of differences in mean scores of critical thinking levels.

Level of Critical Reflection	Testing	$\overline{x}$	SD	t	Sig.
Technical Rationality	Pre-Test	24.39	2.22	7.66	.001*
	Post-Test	26.86	1.67		
Reflectivity	Pre-Test	29.36	2.20	5.90	.001*
	Post-Test	30.94	2.04		
Critical Reflection	Pre-Test	27.67	3.84	5.02	.001*
	Post-Test	30.61	2.54		
Total	Pre-Test	81.42	6.34	9.94	.001*
	Post-Test	88.42	4.88		

*p-value = .001

Paired t-tests revealed significantly higher post-test scores across all domains (p = .001). Overall critical reflection increased from 81.42 to 88.42 (t = 9.94), demonstrating substantial cognitive development following the intervention. Develop an Effective Learning Activity Package that Combines Case-Based Learning with Brainstorming Techniques to Strengthen Critical Reflection in Nursing Students.

Discussions Of Research Results

1. Develop a learning activity package that combines case-based learning with brainstorming techniques to strengthen critical reflection in nursing students at the 80/80 criterion standard.

The research findings showed that the LAP was highly effective, exceeding the established standards with E1/E2 values of 88.88/91.85, respectively. This demonstrates that research and development (R&D) conducted using a systematic design process can lead to high-quality learning innovation. This matches Brahmawong (2002) and Sutthirat (2018) framework for effective teaching design, where objectives, content, activities, and assessment work together as a coherent system. Consequently, the expert evaluation results regarding the consistency of the learning activity package confirmed its appropriateness for implementation in learning management.

This design structure ensures the self-sufficiency of the LAP and supports the teacher's role as a learning facilitator, consistent with the learner-centered approach (Pantaewan, 2016). Diaz et al. (2023) recommended exactly this approach—using models, frameworks, and discussions to help students apply knowledge in practice. The effectiveness of the LAP is partly due to the integration of learning through case-based learning and brainstorming techniques. Case studies recreate the complexity of real clinical work (Phormpayak et al., 2019), requiring students to combine insights from different fields to work through problems. Instead of passively receiving information (Kanhadilok et al., 2019; Rattanaprom et al., 2025), brainstorming techniques support interactive learning by allowing learners to freely exchange ideas based on Osborn's (1957) principles. This results in reasoning, in-depth discussions, and collaborative knowledge construction, which aligns with the professional reasoning concepts of Zeichner and Liston (1987) and the research of Macartney et al. (2021), who found that group processes in critical reflective activities play a crucial role in supporting and enhancing students' clinical reasoning skills development by facilitating knowledge exchange and fostering deeper understanding.

The case studies that create realistic problem contexts, combined with brainstorming techniques that generate powerful collaborative learning processes, establish clear learning pathways that systematically guide students from Technical Rationality to Reflectivity, and ultimately to Critical Reflection in a concrete and effective manner. This entire process aligns with the concept of Transformative Learning, which emphasizes creating profound learning experiences capable of changing learners' perspectives and worldviews (Panich, 2015). The outcomes achieved are not merely increased knowledge, but enhanced capacity for complex and sophisticated thinking—the most essential competency for professional nurses in the 21st century.

2. Compare Nursing Students' Critical Reflection Abilities Before and After Completing the Learning Activity Package Combined Case-based Learning with Brainstorming Techniques.

The research findings showed that nursing students' average critical reflection scores increased significantly across all aspects after using the learning activity package. This improvement was not simply a matter of increased content knowledge, but it reflected a systematic cognitive transformation in how students think. These results can be explained by examining how the learning innovation functions. It serves as a transformative driver that moves learners beyond technical rationality, where problems are solved through standard procedures for immediate results, toward critical reflection, which Zeichner and Liston (1987) describe as the highest level of reflective thinking.

This transformation occurred through the design of activities that emphasized thought-provoking processes and the analysis of complex case studies. The aim was to create cognitive dissonance by presenting learners with ethically ambiguous situations that had no clear-cut answers. This prompted nursing students to question and challenge their assumptions, and to examine how power structures or biases might compromise patient care and safety. In developing cognitive skills, a crucial foundation lies in integrating case studies that address ethical issues and conflicting values. These case studies serve a dual purpose: they push learners to find empirical evidence for rational decision-making, and they help nursing students grasp the emotional and psychological aspects of caring for patients. This finding is consistent with Chiu (2025), who found that when learning integrates cognitive and emotional processes, it fosters both cognitive maturity and a deeper understanding of humanistic care. As a result, learners can view problems comprehensively, encompassing complex medical, social, and cultural dimensions of the problem.

Well-designed case studies incorporate complex ethical, social, and cultural dimensions, including learning about ethical decision-making among nursing students, which stimulates students to engage in critical self-reflection. This leads to transformation of inappropriate existing frameworks of thinking and development of enhanced abilities to analyze ethical situations (Kanhadilok et al., 2019; Pakdeto & Arpaichiraratana, 2016). When students brainstorm and discuss various approaches, the conversations extend beyond technical matters to encompass questions of values and ethics, which constitute the essence of critical reflective thinking according to Zeichner and Liston's (1987) concept. Students must provide rationales for their choice of nursing approaches by referencing theoretical knowledge and empirical evidence. The research findings showing significant improvement in this dimension confirm the effectiveness of case studies in establishing the necessary foundation for rational thinking, which aligns with the research by Sakulrungjalas et al. (2023), who found that case-based teaching programs can effectively develop nursing students' critical thinking skills. Similarly, Seshan et al.'s (2021) study revealed that case studies not only facilitate deep and sustainable learning but also enhance nursing students' ability to apply knowledge in real-world situations.

Furthermore, the collaborative brainstorming approach, which has students record their thoughts privately before group discussion, also contributes to psychological safety. This reduces the influence of groupthink and alleviates psychological barriers for learners who lack confidence, leading to an open and systematic examination of reasoning and the exchange of diverse perspectives. This aligns with the principles of Osborn (1957) and Mezirow's (2000) concept of transformative learning. However, this learning process depends heavily on instructors who act as reflection facilitators. By asking open-ended questions, guiding discussions, and conducting thorough debriefings, they create an atmosphere of trust and empathetic listening while encouraging students to independently draw ethical conclusions. This environment is essential for nursing students to continuously reflect on, challenge, and refine their professional worldview. Over time, students shift from merely following procedures to becoming lifelong learners who base their decisions on human values, a critical capacity for navigating complex healthcare environments.

Recommendations

1. Recommendations for Applying Research Results

1.1 Nursing institutions should integrate case-based learning combined with brainstorming techniques into clinical practice courses to foster continuous critical reflection.

1.2 Instructors must be systematically prepared to assume the role of facilitators rather than traditional lecturers.

1.3 Professional development workshops should emphasize effective questioning techniques and the creation of a psychologically safe learning environment.

1.4 The learning environment must enable students to participate openly, express diverse perspectives, and engage meaningfully in reflective dialogue throughout the learning process.

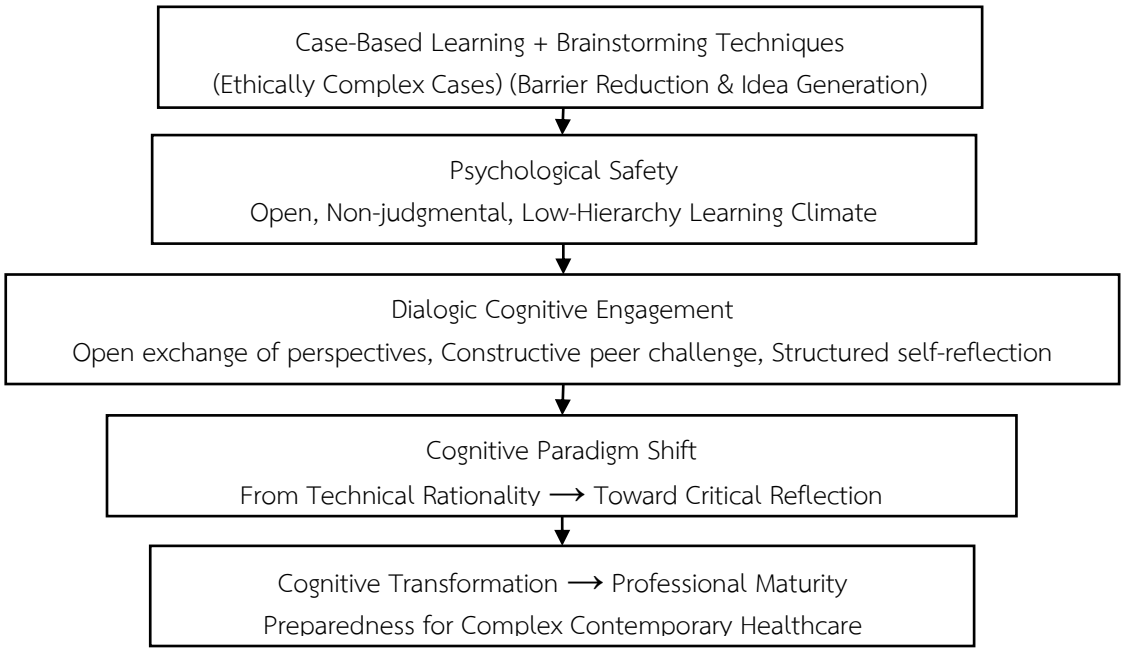
2. Recommendations for Future Research

2.1 Future research should employ rigorous designs, such as comparing the intervention with control groups, to validate effectiveness.

2.2 Long-term studies are required to evaluate the sustainability and transferability of critical reflection skills in professional practice.

2.3 Qualitative methods (e.g., observations, interviews) should be incorporated to understand the underlying cognitive mechanisms and learning behaviors.

New Knowledge or Discoveries



The figure illustrates how the systematic integration of case-based learning and brainstorming techniques functions as a structured instructional mechanism that establishes psychological safety. This safe dialogic environment activates higher-order cognitive engagement, facilitating a paradigmatic shift from technical rationality to critical reflection. The process ultimately supports cognitive transformation and professional maturity in nursing education.

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