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Problem-Based Learning and Simulation as Effective Pedagogical Tools in Nursing Pharmacology: A Descriptive Study

Hilda Dwi Yolanda[1], Chrisnawati[2*], Irfan Maulana[3]
[1,2,3]School of Nursing, Medical Faculty and Health Sciences, Lambung Mangkurat University

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ABSTRACT

Nursing Pharmacology is considered a challenging subject that requires innovative teaching methods such as Problem Based Learning (PBL) and simulation. PBL fosters active learning, critical thinking, and problem-solving, while simulation enhances understanding through practical experience. This study aimed to evaluate the satisfaction and self-confidence of nursing students in the pharmacology course using the Problem Based Learning (PBL) and Simulation methods. This descriptive quantitative study involved 73 respondents, selected using total sampling. The research instrument was a questionnaire. Data were analyzed using univariate analysis. The results indicated that the majority of students had high satisfaction and self-confidence regarding the PBL and simulation methods in the pharmacology course. Specifically, 68.5% were satisfied, 28.8% were very satisfied, 74.0% felt confident, and 23.3% felt very confident. The PBL and simulation methods in the pharmacology course effectively enhanced student satisfaction and self-confidence, with most respondents reporting positive outcomes.

Mata kuliah farmakologi yang dianggap sulit membutuhkan metode pembelajaran inovatif seperti Problem Based Learning (PBL) dan simulasi. Metode PBL mendukung pembelajaran aktif, berpikir kritis, serta pemecahan masalah, sementara simulasi meningkatkan pemahaman melalui pengalaman praktis. Tujuan penelitian ini adalah untuk mengetahui gambaran kepuasan dan kepercayaan diri mahasiswa keperawatan pada mata kuliah farmakologi keperawatan dengan metode Problem Based Learning (PBL) dan Simulasi. Penelitian ini merupakan penelitian deskriptif kuantitatif melibatkan 73 orang responden, yang diambil menggunakan teknik total sampling. Instrumen penelitian menggunakan kuesioner. Data dianalisis menggunakan analisis univariat. Hasil penelitian menunjukkan mayoritas mahasiswa memiliki kepuasan dan kepercayaan diri yang tinggi terhadap metode pembelajaran PBL dan simulasi pada mata kuliah Farmakologi Keperawatan, dengan 68,5% merasa puas, 28,8% sangat puas, dan 74,0% merasa percaya diri, serta 23,3% sangat percaya diri. Metode PBL dan simulasi pada mata kuliah Farmakologi Keperawatan terbukti efektif meningkatkan kepuasan belajar dan kepercayaan diri mahasiswa, dengan mayoritas responden merasa puas dan percaya diri

Corresponding Author:

Chrisnawati

School of Nursing, Medical Faculty and Health Sciences, Lambung Mangkurat University, Banjarbaru Indonesia 70114
Email: ***chrisnawati@ulm.ac.id***

Introduction

Nursing students are individuals enrolled in professional academic programs at higher education institutions, including vocational, academic, and professional levels (Purwaningrum et al., 2024). Research in this area is important because nurses play a crucial role in the healthcare system, particularly in the application of clinical skills that require a deep understanding of medical aspects such as pharmacology. As frontline providers, nurses must possess high competency in clinical decision-making, medication administration, and monitoring patient response to treatment (Putra et al., 2021). This study aims to explore how learning methods such as Problem-

Based Learning (PBL) and simulation improve nursing students' learning satisfaction and confidence in pharmacology courses, thus preparing them to face professional challenges (Toqan et al., 2023).

Pharmacology in nursing education encompasses both theory and practice, and plays a crucial role in routine nursing tasks during clinical practice. Therefore, effective teaching strategies are necessary to ensure students not only understand and memorize but also apply the knowledge practically. Nursing institutions design active learning strategies to support this understanding. Active learning positions students as independent learners who develop knowledge through participation, thereby improving learning outcomes, motivation, self-efficacy, and confidence (Yiin & Chern, 2020).

Pharmacology, the study of drug use, therapy, and side effects, is often considered challenging by students. Therefore, this field has become the focus of research related to learning satisfaction and confidence through PBL and simulation. A solid understanding of pharmacology is crucial because safe and effective clinical practice is inseparable. Through PBL and simulation, students are actively engaged in the learning process, improving critical thinking skills, and building confidence in clinical decision-making (Song & Kim, 2023). This research is expected to provide new insights to improve the quality of pharmacology learning and support the development of clinical competencies.

Traditional learning methods, such as lectures and discussions, have long been the primary approach in nursing pharmacology education (Toqan et al., 2023). While lectures are effective in conveying information quickly, they often fail to ensure understanding and application of knowledge in clinical practice (Issroviatiningrum & Suyanto, 2017). Research shows that lectures are less effective than other methods (Sari et al., 2020), resulting in lower learning satisfaction and confidence in the clinical setting. Therefore, a more active learning approach is needed (Putra et al., 2021). Active learning strategies have been shown to be more effective in predicting student performance outcomes than passive learning (Novianti et al., 2020).

Problem-Based Learning (PBL) is a learning model that encourages critical thinking through student engagement in collaborative and reflective problem-solving (Matshaka, 2023). In PBL, instructors present real-world problems, and students then work in groups to formulate and identify solutions based on their existing knowledge. This process enhances understanding while encouraging independent learning (Novianti et al., 2020). This model is designed to foster analytical skills, problem-solving skills, and independent learning (Pratiwi & Setyaningtyas, 2020). At Universitas Lambung Mangkurat, the nursing program implements PBL through tutorials in focus group discussions, conducted in two meetings for each case with four discussion topics. Self-directed learning and small group learning are also integrated into the PBL approach. PBL has been shown to be effective in increasing nursing students' satisfaction and self-confidence (Susanti et al., 2024).

The problem-solving component of PBL aims to improve learning outcomes through case evaluation, analysis, and understanding. Students are trained to seek information and validate its validity (Song & Kim, 2023). This method is expected to shift students' mindsets to become more analytical and able to solve problems effectively (Putra et al., 2021).

Simulation-based learning, including laboratory practices and skills labs, is also effective because it engages multiple senses, helping students absorb information more optimally (Azmi et al., 2024). Enhanced learning through simulation plays a crucial role in increasing student satisfaction and confidence (Prayogi, 2023). Learning satisfaction reflects students' attitudes toward their learning experiences and the extent to which their expectations are met. It is also a key indicator of teaching effectiveness (Novianti et al., 2020).

Learning satisfaction also determines student motivation and acceptance of learning strategies (Yu, 2022). Self-confidence is as important as learning quality, as it significantly influences academic performance. Students with high self-confidence are more open to challenges and have a stronger motivation to learn (Ballane, 2019). According to Benabou & Tirole, self-confidence influences motivation, behavior, and problem-solving abilities. Low self-confidence often leads to weak motivation and poor learning outcomes (Ridha & Akbar, 2020).

A preliminary study conducted through interviews with pharmacology lecturers revealed that pharmacology learning was implemented with six practical sessions and four PBL sessions. This adjustment was made because many students failed the course, so an innovative method was introduced. This study is the first to evaluate satisfaction and self-confidence using PBL in this context. Preliminary findings also indicate that second-year students who have taken pharmacology expressed dissatisfaction (100%) with lecture-based learning. In contrast, all respondents (100%) in the preliminary study expressed satisfaction with simulation and PBL.

Respondents stated that simulations and PBL gave them more freedom to express their ideas and thoughts, ultimately enhancing understanding. Unlike traditional lectures, which can feel monotonous, PBL emphasizes real-life case studies and problem-solving, making learning more engaging and dynamic. This approach encourages hands-on participation, group collaboration, and problem analysis, which not only enhance understanding but also develop critical and analytical thinking skills.

Traditional lectures often leave students as passive listeners, leading to boredom and decreased active engagement. In contrast, students found PBL to be more effective in increasing learning satisfaction and self-confidence. By engaging directly in problem-solving, they felt more confident in mastering the material and better prepared to face professional challenges.

In preliminary interviews, students expressed high hopes for mastering pharmacology, given its importance to nursing practice. Some students also reported difficulties with rote-based learning, which led to boredom and poor retention. They preferred practice-based learning that involved solving real-life cases in groups and individually, and opportunities to express opinions based on problem analysis. Mastery of pharmacology knowledge and skills, they noted, increased their confidence in applying them to patient care during practice.

Based on this background, this study aims to evaluate the level of learning satisfaction. nursing students in pharmacology courses taught using PBL and simulation. Self-confidence and how high the level of self-confidence is among the nursing students.

Research Methods

Research Design

This research uses a descriptive quantitative research design,namely analyzing a phenomenon to describe the phenomenon being studied without testing the relationship between variables and without conducting experiments on research subjects.

Population and Sample

The population in this study consisted of 73 active third-semester students of the Nursing Study Program, Faculty of Medicine and Health Sciences, Lambung Mangkurat University, who had completed the nursing pharmacology course. The sampling technique used was total sampling, meaning the entire population was used as research subjects, resulting in a total sample of 73 students (Nurfalah Setyawati & Hartyowidi Yuliawuri, 2023).

Research Instruments

The instrument used in this study was the Satisfaction and Self-Confidence in Learning Scale (SSLS) questionnaire, which measures nursing students' satisfaction and self-confidence. This questionnaire consists of 13 items, with 5 items assessing satisfaction with the simulation activity and 8 items measuring self-confidence, using a 5-point Likert scale.

The answer choices range from “Strongly Disagree (STS),” “Disagree (TS),” “Undecided (BM),” “Agree (S),” to “Strongly Agree (SS)”. This instrument has been translated into Indonesian and has been tested for validity 0.520 and test reliability with a Cronbach α value of 0.795 (Dwi et al., 2024).

Research Procedure

In this study, the research team followed the steps below:

1. Preparation of learning modules and practicum modules containing a combination of theory, PBL, and simulation by the Nursing Pharmacology teaching team
2. Orientation to align perceptions within the teaching team: the PBL team and the laboratory team, regarding teaching methods, scenario content, learning outcomes (LO), and assessment of learning outcomes
3. The PBL team conducted the PBL process using several pre-designed scenarios with student groups, consisting of (Tutorials, SDL (Self-Directed Learning), SGL (Small Group Discussion), and concluding with an Expert Lecture)
4. During the tutorial scenario, the “seven jumps” approach is applied: clarifying/identifying terms, defining the problems, analyzing the problems, systematically listing all explanations for the above points and summarizing them (problem tree), formulating learning objectives, synthesizing and self-testing (synthesize and test acquired information)
5. Practicum activities are conducted in the form of simulations in the nursing laboratory and large lecture halls by the practicum team
6. Evaluation concludes with an assessment: for cognitive competencies via quizzes and midterm exams and for skill competencies via practicum exams
7. The research team measures student learning satisfaction and self-confidence

Data analysis

In this study, univariate analysis was used to identify the characteristics of respondents, including age, gender, level of learning satisfaction, and level of self-confidence of nursing students.

Research Ethics

This study has obtained ethical approval from the Health Research Ethics Committee of the Regional Board of PPNI Banjarbaru Regency with approval number 092/EC/KEPK/-DPDPPNI/XI/2024. Prior to data collection, participants were provided with clear information regarding the objectives and procedures of the study and signed a consent form after an explanation (*informed consent*) in writing. Throughout the research process, the anonymity, confidentiality, and privacy of all participants were strictly maintained.

Results

In this study, 73 nursing students who had completed a nursing pharmacology course participated as respondents. The results are presented in the following table.

Respondent Characteristics

The demographic profile of the participants was evaluated based on gender and age distribution, as consolidated in Table 1. A total of 73 students participated in this study. In terms of gender distribution, the sample was predominantly female, accounting for 78.1% (n = 57) of the total respondents, whereas male students comprised

the remaining 21.9% (*n* = 16). Regarding chronological age, the sample exhibited complete homogeneity; all 73 participants (100.0%) fell within the range of 17 to 25 years, which corresponds to the developmental stage of late adolescence. This demographic distribution indicates that while the participant pool is highly unified concerning developmental and educational readiness, it reflects a substantial gender imbalance characterized by a female-to-male ratio of nearly 4:1.

Table 1

Demographic Characteristics of Respondents (N = 73)

Variable	n	%
Gender		
Male	16	21.9
Female	57	78.1
Age Group		
Late Adolescence (17–25 years)	73	100.0

1. **Nursing Student Satisfaction in Pharmacology Course after Implementation of Problem-Based Learning dan Simulation**

   The results showed that the majority of students were satisfied with the implementation of Problem-Based Learning (PBL) and simulations in the nursing pharmacology course about 50 students (68.5%) expressed satisfied, while 21 students (28.8%) expressed strongly satisfied. Meanwhile, 2 students (2.7%) expressed neither satisfied nor dissatisfied, and no respondents expressed dissatisfaction or very dissatisfaction.

Tabel 2.

Nursing Student Satisfaction in the Pharmacology Course after Implementing Problem-Based Learning and Simulation

No	Student Satisfaction	Frequency	Percentage
1	Strongly Dissatisfied	0	0
2	Dissatisfied	0	0
3	Neither Satisfied nor Dissatisfied	2	2,7
4	Satisfied	50	68,5
5	Strongly Satisfied	21	28,8
	Total	73	100

2. **Nursing Students' Self-Confidence in Pharmacology Courses after Implementing Problem-Based Learning and Simulation**

   The results presented in Table 3 indicate that the majority of students felt confident in the pharmacology course after the implementation of PBL and simulation. Fifty-four students (74.0%) reported feeling confident, while 17 students (23.3%) reported feeling very confident. Two students (2.7%) reported feeling somewhat confident, and no respondents reported feeling unconfident or very unconfident.

Table 3

Nursing Students' Self-Confidence in the Pharmacology Course after the Implementation of Problem-Based Learning and Simulation

No	Student Satisfaction	Frequency	Percentage
1	Very Unconfident	0	0
2	Lack of Self-Confidence	0	0
3	Enough Self-Confident	2	2,7
4	Self-Confidence	54	74,0
5	Very Confident	17	23,3
	Total	73	100

Discussions

The demographic findings of this study reveal that the majority of respondents were female (78.1%), a distribution that accurately reflects the prevalent demographic trends within global and Indonesian nursing education. While nursing has historically been perceived as a female-dominated profession, the field is increasingly diversifying to meet the demand for male nurses in various dynamic clinical settings. Gender dynamics play a nuanced role in shaping learning preferences; previous studies indicate that female students often exhibit a strong affinity for collaborative, interactive, and team-based learning approaches (WHO, 2020). The Problem-Based Learning (PBL) and simulation methods utilized in this study cater directly to these preferences by fostering communication and collaborative problem-solving. Furthermore, the psychologically safe environment provided by simulation enables students to practice critical clinical skills without the immediate risks associated with direct patient care, thereby significantly boosting their confidence. Although this high proportion of female students undoubtedly influenced the aggregate positive outcomes, the findings remain a highly representative and valuable reflection of the broader nursing student population in Indonesia.

Chronologically, the entire participant cohort (100%) fell within the age range of 17 to 25 years, categorizing them in the developmental stage of late adolescence. This stage is critical for cognitive and emotional development, characterized by expanding independence, social maturity, critical thinking, and emotional regulation, all of which are fundamental prerequisites for success in higher education. Students in this demographic demonstrate a heightened adaptability to innovative, student-centered learning strategies (Astuti & Sundari, 2020). PBL and simulation, which emphasize real-world problem-solving, active teamwork, and the immediate clinical application of theoretical knowledge, align seamlessly with the developmental milestones of late adolescents, thereby facilitating a more meaningful and engaging learning experience.

Regarding pedagogical efficacy, the results demonstrate that an overwhelming majority of students were satisfied with the PBL and simulation methods implemented in the Nursing Pharmacology course. Specifically, 68.5% of respondents reported being satisfied, and 28.8% reported being strongly satisfied, with absolutely no expressions of dissatisfaction. Student satisfaction is closely linked to the alignment between educational expectations and actual learning outcomes, a primary determinant of success in higher education (Novianti et al., 2020; Purwaningrum et al., 2024). Pharmacology is notoriously regarded as a highly challenging discipline due to its dense, complex concepts. Traditional didactic lectures often fail to make these abstract concepts accessible, but PBL actively bridges the theory-practice gap by requiring students to engage in clinical case discussions, which effectively improves understanding and critical thinking skills (Sasmita & Harjono, 2021). Concurrently, simulation provides a controlled, low-stakes environment where students can safely practice medication administration and clinical decision-making, significantly increasing motivation and engagement while reducing anxiety (Kim et al., 2017; Toqan et al., 2023).

Despite these overwhelmingly positive responses, a small fraction of students (2.7%) expressed feeling "neither satisfied nor dissatisfied". Rather than being an anomaly, this neutrality highlights the inherent cognitive and

emotional challenges associated with transitioning from a traditional passive learning model to a highly active, student-centered approach. PBL demands significant self-directed learning and proactive participation, which may induce discomfort for students unaccustomed to peer-based collaborative learning. Furthermore, learning satisfaction is heavily influenced by contextual factors, including the facilitative role of the tutor, available facilities, the social environment, and the design of the learning scenarios (Astuti & Sundari, 2020; Batubara et al., 2019). This finding underscores the necessity for educators to implement pedagogical scaffolding and optimize these contextual variables to support diverse learning styles.

In tandem with high satisfaction rates, the integration of PBL and simulation significantly enhanced students' self-confidence in mastering pharmacological competencies. A substantial 74.0% of students felt confident, and 23.3% felt very confident, with zero respondents reporting a lack of confidence. This robust surge in self-efficacy reflects the effectiveness of actively engaging students and enabling the application of theory into practice (Wahyu Ariyani & Prasetyo, 2021; Matshaka, 2023). High levels of self-confidence are heavily influenced by students' beliefs about the relevance of PBL and simulation in mastering essential responsibilities as future professional nurses (Nisa & Wulandari, 2019; Sidharta et al., 2023). By engaging directly with realistic pharmacological scenarios, students cultivate strong clinical reasoning skills and are empowered to practice critical decision-making in clinical settings (Toqan et al., 2023; Alharbi et al., 2024).

However, it is crucial to analyze the 2.7% of respondents who reported feeling only moderately confident (categorized as "enough self-confident"). This moderate level of confidence may stem from limited prior clinical exposure, difficulties in keeping pace with the dynamic nature of group discussions, or generalized performance anxiety. While simulation and PBL inherently create a safe learning environment, previous evidence highlights that some students still require targeted, individualized support to truly master the material (Kim et al., 2017; Son, 2023). Educators should consider incorporating structured post-simulation debriefing sessions and offering repeated practice opportunities to help these specific students build enduring self-assurance.

Overall, this study confirms that the integration of PBL with simulation successfully achieves learning objectives by building clinical competency while simultaneously enhancing student confidence (Alsadi et al., 2023; Putra et al., 2021; Dewi & Asikin, 2019). By contextualizing theoretical concepts within realistic clinical frameworks, these pedagogical tools are invaluable in preparing nursing students for professional clinical practice (Song & Kim, 2023; Matshaka, 2023).

Research Limitations

While the findings present a compelling case for active learning modalities, this study acknowledges several limitations that warrant consideration in future research. The study utilized a relatively small sample size and a descriptive, cross-sectional design, which precludes the establishment of definitive causal relationships between the pedagogical interventions and student outcomes. The total population sampling technique and reliance on self-report questionnaires also introduce the potential for social desirability bias, meaning the results may not be fully representative of the wider population. To build upon these findings, future studies should utilize bivariate and multivariate analyses to account for potential confounding variables and provide more robust evidence regarding the efficacy of PBL and simulation in nursing education.

Conclusion

This study shows that the implementation of *Problem-Based Learning* (PBL) and simulation in the Nursing Pharmacology course significantly contributed to increasing student satisfaction and confidence. The majority of respondents expressed satisfaction (68.5%) or very satisfaction (28.8%), with no reports of dissatisfaction. Similarly, most students felt confident (74.0%) or very confident (23.3%) after participating in this method, indicating that PBL and simulation successfully created an interactive, engaging, and supportive learning environment.

In addition, these findings emphasize PBL and simulation as innovative learning strategies in nursing education, especially in courses that require mastery of theory as well as clinical application. By encouraging active learning, teamwork, and critical problem solving, this approach not only enhances the learning experience students but also prepare them for future professional practice. Thus, the integration of PBL and simulation can be considered as a valuable learning approach to optimize academic outcomes and clinical competence of nursing students.

CreDit Author Statement

Hilda Dwi Yolanda: Conceptualization, Methodology, Investigation, Data Curation, Writing – Original Draft **Chrisnawati:** Conceptualization, Formal Analysis, Writing – Review & Editing, Supervision, Project Administration. **Irfan Maulana:** Methodology, Validation, Resources, Writing – Review & Editing.

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