"ENHANCING PAEDIATRIC NURSING SKILLS THROUGH SIMULATION-LINKED PROBLEM-BASED LEARNING(S-PBL): A QUASI-EXPERIMENTAL STUDY"

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ABSTRACT

Introduction

Rapid advancement in health care area and the burden of disease get new challenges for health workers. The rapid spread of disease places a significant strain on the health care system and nursing schools and colleges, disrupting staffing and forcing students to complete their educational requirements in hospital. Due to student 's inability to put their theoretical knowledge in to practice. Both the theoretical and practical components in nursing education are divided in these circumstances.[1]

S-PBL is a technique of problem-solving which makes use of real situations. In relation to Nursing education, it aids nurses in acquiring the problem-solving abilities required to address the numerous health issues come across during clinical practice. The ability to solve numerous patient health issues after graduation is an advantage for nursing students who have been taught clinical scenarios using simulation-linked problem-based learning but have not personally experienced them. Clinical simulation scenarios must reflect genuine clinical scenarios in order for the S-PBL to be effective[2]. Objectives: To compare pretest and post-test mean self-efficacy in paediatric nursing among nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module. To compare mean post- test self-efficacy in paediatric nursing among nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module and control group. To assess the association of self- efficacy in paediatric nursing among nursing students of Experimental and Control group with selected demographical variables. Material and methodsIn this study, A quantitative research methodology and a quasi-experimental (non- equivalent control group) research design was employed in the current investigation. 120 samples were used in the study, which used a purposive sampling strategy. There were 60 samples in the control group and 60 samples in the experimental group. Reliability of tool was done by Cronbach's alpha on all the self- efficacy items to assess the instrument's dependability in its changed version utilizing the reliability of tool was 0.83. Result: Descriptive and inferential statistics were used to analyst the collected data. The findings of the study regarding comparison of pre -test mean self efficacy score in paediatric nursing among nursing students in experimental group at pre- test the mean self- efficacy score and SD was 43.9±10.83 and in control group the mean self -efficacy score and SD was 43.10±10.02. Independent t test was performed to compare their test self-efficacy score. The calculated t value and p value was 0.89 and 0.71 respectively. The t-test revealed that there was no significant difference between both the groups at pretest scores as p>0.05. The findings of the study

about the comparison of level of self-efficacy score of nursing students in paediatric nursing before and after implementation of simulation linked problem- based learning module depict that the pre -test mean was 43.9 and SD ±10.83, whereas in post -test mean was 65.72 and SD ±9.34 the mean difference between pre -test and post- test self -efficacy score was very large i.e 21.82 and the difference is statistically significant. It was calculated by using student paired t test. The t value was 14.82, p=0.03. it shows significant at the level of p<0.05. Conclusion: It has been concluded that the simulation linked problem- based learning module is an effective and an innovative teaching pedagogy in improving the self- efficacy of B.Sc. Nursing 3rd year students in Paediatric Nursing practicum. The Post- test score comparison of level of self-efficacy score of nursing students in paediatric nursing in experimental and control group depict that in post- test mean was 65.72 and SD ±9.34 whereas in post- test of control group the mean of self- efficacy was 42.48 and SD was ±10.16 the mean difference between post- test self- efficacy score of both groups was very large i.e 23.24 and the difference is statistically significant. It was calculated by using independent t test. The t value was 15.32, p=0.02. it shows significant at the level of p<0.05.

Key Words:(Simulation, Problem based learning, pedagogy, nursing education, problem solving, self-efficacy)

Introduction

Nursing healthcare students acquire the necessary knowledge and abilities to provide expert care to patients and their families across different environments through their academic study. In their baccalaureate-level nursing education, students merge theoretical foundations of nursing and health sciences while also applying their professional expertise in various sectors.[3]

The philosophy and educational principles of each university's nursing curriculum affect learner stability, which is a component of learning theory and practice. Children are challenging group for nursing students to prepare for practice. This is due to a variety of factors. First, the curriculum may only provide for a limited amount of classroom and clinical practice time to learn about paediatric nursing. Second, many students are afraid of the hospital atmosphere and the acuity level of paediatric patients as they begin clinical experience in caring for children. Third, they may have uneasiness when speaking with their parents. Fourth, the number of students admitted to the undergraduate nursing programme at college of nursing has increased dramatically.[9] Administrators and professors are increasingly pushed to guarantee that students are completely equipped for practice as a result of this expansion. A robust knowledge base in paediatric clinical care is part of the student's preparation.[4]

Simulated scenarios have proven to be valuable teaching tools in academic and therapeutic settings. The advanced technology used in high-fidelity simulations now offers viable alternatives to the traditional "see one, do one" clinical teaching approach. Healthcare providers can safely practice their clinical and team-building skills without putting patients at risk. Simulated learning aims to bridge the gap between experiencing an event and understanding it. According to Carmen (2014), integrating problem-based learning into instruction facilitates collaborative teamwork among students, enabling them to explore and integrate ideas and perspectives from various viewpoints[5]. This approach simplifies the understanding and learning of principles in different subject areas.[6] Humes (2013) suggests that

problem-based learning offers students the opportunity to integrate knowledge from multiple clinical courses, academic disciplines, and professional experiences. By applying critical thinking, problem-solving skills, and inductive and deductive reasoning, students engage in integrative research[7]. This method nurtures curiosity, fosters the ability to make connections between ideas, and encourages students to approach material from different perspectives, thereby preparing them for real-world experiences beyond the classroom.[4] Consequently, students develop tolerance, humility, and the ability to navigate ambiguity. In 2005, the National Council of State Boards of Nursing (NCSBN) defined simulation as a learning approach that involves learners demonstrating competence, critical thinking, decision-making, and role-playing or utilizing technology within an interactive clinical environment that closely resembles real- world scenarios.[22] The literature has extensively discussed the numerous benefits of employing simulation in the education of undergraduate nursing students. Some of these advantages include providing a safe and non-threatening environment for nursing students to develop and enhance their skills, as well as increasing their ability to effectively manage simulated situations when they arise in real-life settings (Hovancsek, 2007)[8].

Bachelor of Nursing programmes, third-year students are required to complete clinical experience in paediatric nursing. However, securing permission for students to perform their clinical skills and finding available placement opportunities can be a challenge for both nursing programmes and cooperating facilities. Some clinical sites have limitations on the number of students that can participate per day, which can impede the development of students' professional and critical reasoning skills in caring for patients with specific needs and conditions, thereby restricting their range of practice[9].

Simulation-based learning (SBL) is an approach that involves trainers creating simulated clinical scenarios in a safe environment to help healthcare teams develop their clinical skills[11]. Research indicates that SBL is more effective than traditional clinical teaching methods for acquiring clinical skills. While SBL is widely recognized and utilized in resource-rich settings, its implementation and acceptance by stakeholders in medical education are less understood in resource- limited environments.[10]

Existing research data indicates that the integration of simulation-based learning with problem-based learning (PBL) has shown positive outcomes in clinical performance and increased self-efficacy among nursing students. When students engage in PBL through simulation, they gain a deeper understanding of the real- world application of PBL problems[11]. This understanding creates a realistic and authentic context that can contribute to their professional development. Additionally, collaborative learning plays a significant role in this integrated approach, providing students with valuable learning experiences and fostering teamwork skills[11]. Simulation-based learning (SBL) is a highly utilized method in nursing education, and extensive research supports its effectiveness as an educational tool for achieving diverse learning objectives[12].

Hypothesis

On the basis of objectives and review of literature, the following research hypothesis have been formulated:

Research Hypothesis

H_1 - There will be a significant association between pre- test and post- test mean self- efficacy scores in paediatric nursing among Nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module at the level of $p < 0.05$

H_2 -There will be a significant association between mean post- test self- efficacy scores in paediatric nursing among nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module and control group at the level of $p < 0.05$.

H_3 - There will be a significant association between association of self- efficacy in paediatric nursing among nursing students of Experimental and Control group with selected demographical variables.

Methodology

Research Approach: Quantitative research approach will be employed to assess the effectiveness of the S-PBL module.

Research Design : Quasi-Experimental Research (Non-Randomized Control Group)

POPULATION OF THE STUDY

The study's target population consisted of undergraduate nursing students who were enrolled at the Faculty of Nursing within SGT University and the Amity College of Nursing at Amity University in Gurugram.

TARGET POPULATION

In this study target population were Undergraduate Students having Paediatric Nursing subject in their syllabus.

ACCESSIBLE POPULATION

Accessible population in this study were Undergraduate Students having Paediatric Nursing subject in their syllabus Studying in Faculty of Nursing, SGT University and Amity College of Nursing, Amity University, Gurugram.

SAMPLE

The study's samples were drawn from two distinct groups: the Experimental Group consisted of third-year B.Sc. Nursing students studying at the Faculty of Nursing, SGT University, while the Control Group included third-year B.Sc. Nursing students enrolled at Amity College of Nursing, Amity University, Gurugram.

Sample Technique: Purposive Sampling

Sample size: 120 third-year B.Sc. Nursing students. 60-Experimental Group and 60 Control Group

VARIABLES UNDER STUDY

Independent variable was the Simulation-linked Problem- Based Learning (S-PBL)

Dependent Variable: Dependent variables consisted of the self-efficacy of nursing students.

Socio- Demographic Variables – Socio- demographical Variables in the study were Age, Gender,

Mother's Education, father's Education, Previous experience of Problem Based Education. Previous clinical rotation in Paediatric Ward, previously attended any workshop on Simulation

CRITERIA FOR SELECTION OF SAMPLES

Inclusive Criteria: Students studying in B.Sc. Nursing 3rd year. Studying in Faculty of Nursing SGT University and Amity college of nursing. Attendance Percentage in Paediatric Nursing Subject >80%

Exclusive Criteria: Students who were on leave at the time of study, Students were not willing to Participate. The students who missed a portion of the study, the pretest, intervention, or posttest were excluded from the study. Students who had previous experience of Simulation based education.

DEVELOPMENT OF TOOL AND TOOLS DESCRIPTION

Tools developed in this study were General self-efficacy scale

The tool's preparation involved the following stages:

● Section A- Socio Demographical Variables

● Section B- Self- efficacy scale

DATA COLLECTION PROCEDURE

Step -1: Preparation and Validation S-PBL module. It includes preparation of scenarios related to Care of preterm baby with hypothermia, Care of baby with respiratory Distress, Care of baby with feeding difficulty Care of Infant with Respiratory Distress, Care of Infant with Congenital Heart Defects, Care of Preterm with Feeding Difficulty, Care of infant with Neural Tube defect, Care of Infant with Febrile seizures, Care of Infant with dehydration, Care of Newborn with Hypoglycemia, Care of Infant with Pneumonia, Care of infant with third degree burn, Care of newborn with Asphyxia neonatorum. Module was validated bby the experts in Paediatrics and Nursing education.

S-PBL Module

Step -1 Development of S-PBL Module and Content

Simulation linked Problem based learning module was developed using developmental approach. Researcher underwent 6 days Training of Trainer (TOT) Training of Simulation based education.
Simulation linked problem-based Learning (S-PBL) module was developed based on research based and non-research-based approach and seeking opinion of experts in the field of Paediatric Nursing and Simulation based Education.
The module included the knowledge, skills, and critical thinking necessary for problem solving in infants' health status. The students have provided pre learning material so that the students will understand the clinical situation.
The following steps were acquired for development of S-PBL module:

1. Formulating the outline and objectives of the S-PBL module.

2. Preparation of first draft of S-PBL training module.

3. Preparation of criteria Checklist.

4. Content validation of S-PBL module

5. Preparation of final module.

Content included in the S-PBL module were divided in to 2 parts: Part A: Problem based learning
Part B: Simulation Scenarios

Step -2: Operation of S-PBL

The module was comprised of 1hour didactic lecture 2 hours per day problem- based learning session for 5 days and 4 hours per day for 5 days simulation scenario. The didactic lecture on nursing assessment and management of infants with different health problems.
The PBL session was conducted in a classroom equipped with white board and Projector.
The simulation has been conducted for total 24 hrs a week over a period of 6 weeks.

After one-week PBL the students will be posted to National Reference Simulation center, SGT University for Simulation based learning in child health room which was equipped with all paediatric essentials NeoNatalie, Primi NeoNatalie, Radiant warmer, Incubator and phototherapy etc.
Students were divided into 6 groups 10 students in each Group. Each group was posted in National Reference Simulation Centre for 5 days. Each group of students were exposed to 10 simulation Scenario during their rotation.
Steps of simulation were:

Pre-Brief Simulation
                    Debrief   ⬇

                                            ⬇

Pre-Brief: Pre brief is to set the stage for scenario and assist the participants to achieve the scenario goals. It will include:
- Introduction and welcome

- Reinforcement that this the learning platform not for the evaluation.

- Explain about the mutual confidentiality, fiction contract, Respectful participation, and organization of time in Pre brief, Scenario and Debrief.
- Encouragement for Exploration, active participation, being respectful, open to learning during scenario.
- Explain the ground rules of the simulation to ensure a safe, noncompetitive environment.
- Orientation to the environment, equipment, mannequins, patient monitor and its operation
- Discussion around students doing their best but recognizing that mistakes may occur.

- Explained the objectives of scenario and role division.

  Simulation Scenario:

  Each simulation session was run for 11/2 hr.

  And each student in the group got the role of team leader in one scenario.

  Debriefing:

  After the completion of simulation all the participants have attended a debriefing session for 20-30 mins to review video tape of their performance during simulation and to provide feedback to each other in depth discussion.
  It has included:

3. Set the scene

- Timming, phases, & learning objectives

- Nursing students talked about the condition of the child their professional evaluation of the situation
- Chronological description of action.

4. Second phase involves analysis of situation.

5. In third phase students has given time to reflect on whether their newly gained knowledge and experience can be applied in real clinical situation.
   Step 3: Data collection
   Pretest was done before the implementation of problem-based learning and by using general self-efficacy tool prepared in the form of Google forms for both Experimental and control group and Post-test was conducted on the 6th day after completion of one week Simulation rotation and after implementation of by using the same tools for Experimental Group and after completion of 1-week post-test was conducted for Control group.
   Result

Table -1 Frequency and percentage of level of self-efficacy in pre- test and post of Nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module.

n1 +n2= 60 +60=120

Level of Self - efficacy	Score Range	Experimental group			
		Pre-Test		Post Test	
		f	%	F	%

Low Self - efficacy	18-36	14	23.4	0	0
Moderate Self - efficacy	36-54	36	60	8	13.3
High Self - efficacy	54-72	10	16.6	52	86.7

It is evident from the above table- 1 depicts that majority i.e 60% of nursing students had moderate level of self-efficacy. 23.4% nursing students had low level of self- efficacy and only 16.6 % of student had high level of self- efficacy in paediatric nursing.

Whereas in post- test score of self- efficacy majority 86.7% of students had high level of self-efficacy. Only 13.3 % of students had moderate level of self- efficacy and none of the students had low level of self- efficacy in paediatric nursing after administration of simulation linked problem-based learning module.

The comparison of mean self- efficacy of nursing students in paediatric nursing in experimental group before and after implementation of simulation linked problem based learning module that the pre- test mean self- efficacy score was 43.9 and SD
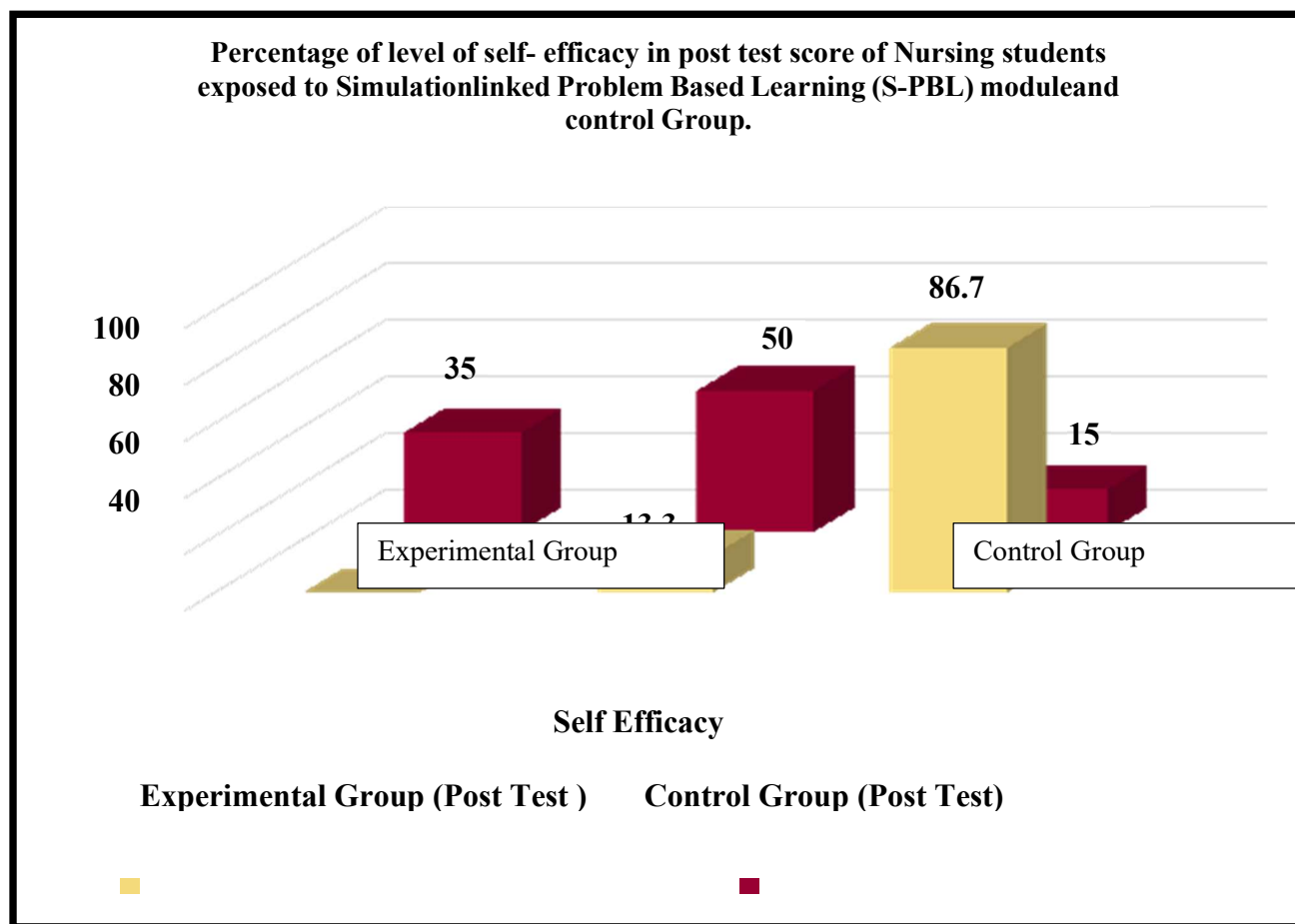
±10.83 , whereas in post- test mean was 65.72 and SD ±9.34 the mean difference between pre- test and post- test self- efficacy score was very large i.e 21.82 and the difference is statistically significant. It was calculated by using student paired t test. The t value was 14.82, p=0.03. it is statistically significant as p<0.05.

The Post- test score of experimental groups shown in fig- 1 depicts that majority i.e 95% of students had high level of self- efficacy. Only 5 % of students had moderate level of self- efficacy and none of the students had low level of self- efficacy in paediatric nursing after administration of simulation linked problem-based learning module.

Whereas in Control group majority i.e 68.3% of nursing students had moderate level of self-efficacy. 21.6% nursing students had low level of self- efficacy and only 10% of student had high level of self-efficacy in paediatric nursing.

Fig:1 - Bar graph shows the percentage level of self- efficacy in post- test score of Nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module and control Group.

Percentage of level of self- efficacy in post test score of Nursing students exposed to Simulationlinked Problem Based Learning (S-PBL) moduleand control Group.

The comparison of Post- test level of self- efficacy score of Nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module and Control Group depicts that in experimental group the comparison of level of self-efficacy score of nursing students in paediatric nursing in experimental and control group depict that in post- test mean was 65.72 and SD ±9.34 whereas in post- test of control group the mean of self- efficacy was 42.48 and SD was ±10.16 the mean difference between post- test self- efficacy score of both groups was very large i.e 23.24 and the difference is statistically significant. It was calculated by using independent t test. The t value was 15.32, p=0.02. it shows statistically significant as p<0.05.

in Experimental group the chi square values showing that the post-test self- efficacy score of B.Sc. Nursing 3rd year students in paediatric nursing was not associated with the selected demographic variables such as age ($\chi2=0.961$) , gender ($\chi2=1.579$), Previously posted in paediatric ward during clinical rotation($\chi2=72$), previously attended any workshop related to Simulation($\chi2=1.463$) , Mother's education ($\chi2=3.299$), and father's education ($\chi2=3.553$) as chi square values were not found to be statistically significant at p>0.05 level of significance. It was found significant with previous experience of Problem based learning ($\chi2=0.70$) at the level of p<0.05 level of significance.

Discussion

The findings of the study depict that depicts that majority i.e 60% of nursing students had moderate level of self-efficacy. 23.4% nursing students had low level of self- efficacy and only 16.6 % of student had high level of self- efficacy in paediatric nursing.

Whereas in post- test score of self- efficacy majority 86.7% of students had high level of self-efficacy. Only 13.3 % of students had moderate level of self- efficacy and none of the students had low level of self- efficacy in paediatric nursing after administration of simulation linked problem-based learning module.

The findings of this study are consistent with the research conducted by Min Sohn, **Youngmee hn, Mijin Lee, Heami Park, et al. (2013).** In their study, a one-group pretest and posttest design were employed. A total of twenty-five students participated in a 5-hour SIM-PBL workshop focused on nursing treatment for hypertensive individuals. A newly developed self-report questionnaire was utilized to gauge self-efficacy (SE) across four domains of the nursing process, measured on a scale from 0 (not at all confident) to 10 (very confident). The four categories encompassed subjective data assessment, physical examination, prioritizing nurse treatment, and health promotion recommendations.

Hence the research hypothesis ―There will be a significant association between pre- test and post- test mean self- efficacy scores of Nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module‖ was accepted.

In experimental group the comparison of level of self-efficacy score of nursing students in paediatric nursing in experimental and control group depict that in post- test mean   was 65.72 and SD ±9.34 whereas in post- test of control group the mean of self- efficacy was 42.48 and SD was ±10.16 the mean difference between post- test self- efficacy score of both groups was very large i.e 23.24 and the difference is statistically significant. It was calculated by using independent t test. The t value was 15.32, p=0.02. it shows significant at the level of p<0.05.

This finding is supported by the study conducted by **Suk y, Suk S et al. (2020)** A non-equivalent one group post-test design on integrative simulation practice on nursing knowledge, critical thinking, problem-solving ability, and immersion in

problem-based learning among nursing students. Samples were allotted in experimental and control group. 42 subjects were allotted experimental group and

40 subjects were in control group. Problem based learning integrated with simulation practice educational programme was administered to experimental group and hands-on practice was provided to the control group. The result of study shown that there were significant difference found between experimental group and control group in nursing knowledge (t=3.67,p<0.001) , critical thinking (t=3.40,p<0.001), problem-solving ability (t=3.52,p<0.001), and immersion (t=4.44,p<0.001) in problem-based learning among nursing students.

Hence the research hypothesis ―There will be a significant association between mean post- test self-efficacy of Nursing students exposed to Simulation linked Problem Based Learning (S-PBL) module and control group is accepted . . It reveals that the simulation linked problem-based learning module is effective in improving the self- efficacy of B.Sc. Nursing 3rd year students in Paediatric Nursing

Conclusion

The study supports the research hypotheses (H_1, H_2 and H_3) that the implementation of the Simulation-linked Problem-Based Learning (S-PBL) module led to significant improvements in self-efficacy scores among nursing students. Additionally, the study found a significant difference in post-test self-efficacy scores between the experimental and control groups, further highlighting the benefits of the S-PBL module.

The study has established that the incorporation of simulation-based problem- based learning (S-PBL) is an effective and innovative approach to teaching that can enhance the self-efficacy of B.Sc. Nursing 3rd year students in paediatric nursing. The findings indicate a strong positive correlation between learning self-efficacy and critical thinking tendencies following S-PBL. The use of S-PBL has been demonstrated to significantly improve the nursing students' ability to self-learn and think critically. Given that the self-efficacy abilities of students can significantly affect their clinical performance as new nurses, incorporating S-PBL education can play a crucial role in improving their skills.

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