การพัฒนาความรู้และความสามารถในการแก้ปัญหาทางการพยาบาลทารกแรกเกิดด้วยการคิดอย่างมีวิจารณญาณโดยการจัดการเรียนรู้แบบปัญหาเป็นฐาน หลักสูตรพยาบาลศาสตรบัณฑิต
The Development of Knowledge and Ability to Solve Neonatal Nursing Problems with Critical Thinking Using Problem-Based Learning of Bachelor of Nursing Science

นิพนธ์ต้นฉบับ **Original Article**

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บทคัดย่อ

วัตถุประสงค์: เพื่อเปรียบเทียบความรู้และความสามารถในการแก้ปัญหาทางการพยาบาลทารกแรกเกิดด้วยการคิดอย่างมีวิจารณญาณก่อนและหลังการเรียนแบบใช้ปัญหาเป็นฐาน **วิธีการศึกษา:** การวิจัยแบบกึ่งทดลอง ชนิดหนึ่งกลุ่มวัดก่อนและหลังการทดลอง กลุ่มตัวอย่างเป็นนักศึกษาหลักสูตรพยาบาลศาสตรบัณฑิต ชั้นปีที่ 2 มหาวิทยาลัยนานาชาติเซนต์เทเรซา ปีการศึกษา 2566 จำนวน 114 คน เรียนรู้โดยใช้คู่มือการเรียนรู้แบบใช้ปัญหาเป็นฐานสำหรับรายวิชาการพยาบาลเด็กและวัยรุ่น รวบรวมข้อมูลโดยใช้แบบสอบถามข้อมูลทั่วไป และแบบประเมินความรู้และความสามารถในการแก้ปัญหาทางการพยาบาลทารกแรกเกิดด้วยการคิดอย่างมีวิจารณญาณซึ่งมีค่าความตรงเท่ากับ 0.67 – 1.00 และค่าสัมประสิทธิความเที่ยงของครอนบาคเท่ากับ 0.88 เปรียบเทียบคะแนนความรู้และความสามารถก่อนและหลังการเรียนด้วย paired t-test **ผลการศึกษา:** ภายหลังการเรียนรู้นักศึกษาพยาบาลมีคะแนนเฉลี่ยความรู้และความสามารถโดยรวมสูงกว่าก่อนเรียน (ค่าเฉลี่ย = 13.07 ± 2.78 และ 18.73 ± 1.89 คะแนน ตามลำดับ) อย่างมีนัยสำคัญทางสถิติที่ระดับ 0.05 (t = 19.882, *P*-value < 0.001) **สรุป:** การจัดการเรียนรู้แบบใช้ปัญหาเป็นฐานสามารถพัฒนาความรู้และความสามารถในการแก้ปัญหาทางการพยาบาลทารกแรกเกิดด้วยการคิดอย่างมีวิจารณญาณของนักศึกษาพยาบาลชั้นปีที่ 2 ได้ ควรจัดให้มีการเรียนรู้โดยใช้ปัญหาเป็นฐานกับนักศึกษาพยาบาลทุกชั้นปี

คำสำคัญ: การเรียนรู้โดยใช้ปัญหาเป็นฐาน, ความรู้, ความสามารถ, การคิดอย่างมีวิจารณญาณ, นักศึกษาพยาบาล

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Abstract

Objective: To compare the knowledge and ability to solve neonatal nursing problems with critical thinking before and after problem-based learning. **Method:** In this quasi-experimental research with one-group pretest-posttest design, the sample consisted of 114 2nd year nursing students at St. Teresa International University, academic year of 2023. Students learned using the manual of problem-based learning for Pediatric and Adolescent Nursing Subjects. A form was used to collect personal data. A questionnaire was used to assess knowledge and ability to solve problems of neonatal of nursing with critical thinking. This questionnaire had content validity index ranging from 0.67 - 1.00, and Cronbach's alpha coefficient for internal consistency reliability of 0.88. Scores of knowledge and ability to solve problems before and after learning were compared using paired t-test. **Results:** After learning, scores of knowledge and ability to solve problems were significantly higher than those before learning (mean = 13.07 ± 2.78 and 18.73 ± 1.89 points, respectively) with statistical significance at 0.05 level (t = 19.882, *P*-value < 0.001). **Conclusion:** Critical thinking using problem-based learning was effective in improving knowledge and ability to solve problems in neonatal nursing among 2nd year nursing students. This kind of learning should be implemented in all years of nursing study.

Keywords: Problem-base learning, Knowledge, Ability, Critical thinking, Nursing students

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Introduction

Registered nurses based on the Thai Qualifications Framework for Higher Education (TQF: HEd) in Nursing Science must be equipped with knowledge in nursing and related sciences, systematical thinking, continuous development, management and teamwork, effective nursing operations, creative thinking, critical thinking, creative decision making, and problem-solving, and the nursing process is employed to solve health problems based on personal rights and safety of service recipients.[1] In the traditional learning process, the instructor was the center of learning, using lectures and discussions in front of the class. The students listened and took notes on key points and analyzed them according to the points planned and assigned by the instructor. This possibly resulted in a less effective summary of the main principles of the content, the linkage of the content through the analytical thinking process, and the student's cognitive skills. Currently, teaching and learning places an emphasis on adult learning with the students as the center, allowing them to develop their learning. Problem-based learning (PBL) encourages students to learn by themselves, to be eager to learn and to think analytically and critically in conceiving problem-solving skills with the team to keep up with

the current changes.[2] Instructors must change their role from knowledge providers to supporters or create a learning atmosphere for students to learn in real situations by solving real or virtual problems, and students are assigned to learn from working in teams along with the exchange of knowledge between experts and students.[3] Importantly, the instructor acts as a designer of problems based on the learning objectives, organizes the learning atmosphere and prepares learning resources to support learners, allows learners to seek knowledge and skills related to those problems, and provides learning where learners are centric. Using problems as a stimulus allows learners to develop new knowledge and connect them to their current knowledge. This process consists of 7 steps: 1) identifying the problem of the given situation; 2) analyzing the cause of the problem and connecting the problem from current knowledge; 3) setting a hypothesis that is the cause of the problem and prioritizing the problem; 4) developing learning objectives to solve problems; 5) studying additional knowledge; 6) using the knowledge to confirm the hypothesis and solve the problem; and 7) summarizing the knowledge gained for higher learning achievement of the learners, resulting in more systematic and critical thinking.[2] This fosters good relationships, participation in learning among members, teamwork, thinking-problem solving, and decision-making and develops responsibility in learners.[4] Moreover, the acquired knowledge can be applied to work in real situations. Based on literature review on problem-based learning by Napaporn et al. (2017)[5], it was found that after using problem-based learning, the students' mean score of learning outcomes in terms of overall intellectual skills was higher than before problem-based learning with a statistical significance (t= -21.38, *P*-value < .001). This may be a result of the learners having to learn by themselves. They changed from passive learning to active learning.[4]

In the present day, society is dynamic and modernized in terms of technology, information, and the application of teaching methods in nursing courses, emphasizing learners as the center and learners' participation, creating curiosity, developing critical thinking skills along with good communication, adapting to situations, listening to the feelings of colleagues, service recipients, and working with other departments in the health team under holistic nursing care based on care behaviors.[6] This allows nursing students to analyze and synthesize knowledge by themselves, leading to a deep understanding of knowledge to link previous knowledge to new knowledge, and developing a rational understanding through case studies in real life, which is a strategy for developing rationality and self-learning. Learners create knowledge by themselves. Learning is a search for new knowledge, where learners learn from problems and situations that are specifically designed and established. Problems are the foundation of the learning process and a stimulus for developing problem-solving skills with reason and searching for information to understand the problem, including problem-solving methods. Problem-based learning focuses on developing learners in terms of skills and learning processes to be able to learn by self-guidance to practice building knowledge through the thinking process by solving problems that are meaningful to the learners. In the study of Sireewat Ar-yuwat (2017)[7], problem-based learning was employed in the Family and Community Nursing 2 Course in the fourth-year students on community health problem analysis and problem-solving in the fourth-year students, and it was discovered that 66.2 percent of them agreed that problem-based learning delivered an opportunity for students to learn by themselves, making them remember the content and apply the knowledge. Therefore, it is sustainable learning. This is in line with the study of Tassanee Trisayaluk and Bamphen Phongphetdit (2018)[8], studying the learning outcome in practice by analyzing case examples and focusing on reflecting ideas from problems solved to analyze decision-making approaches. Learning comes from judgments based on correct principles and theories. It was found that nursing students could solve nursing problems with better critical thinking skills and are more satisfied in their studies. This is in line with the study of Kanjananat Tongmuangtunyatep et al. (2018)[9], where problem-based learning was employed in the Midwifery and Maternal Newborn Nursing 2 Course in the fourth-year students and it was found that the mean learning outcome by using nursing processes in caring for mothers and infants with health problems due to pregnancy, which was taught using problem-based learning of the students after studying was higher than before studying at a statistical significance of .05. The students developed skills in analytical thinking, problem-solving, and creative thinking, participated in learning, and successfully sought additional knowledge from external and new sources. It can be concluded that problem-based learning is crucial for the students.

Carl R. Rogers's Humanism Theory[10] is a concept in learning management with learners as the center with the goal of education is to facilitate learners to learn. The process of seeking knowledge creates a solid foundation and emphasizes the importance of the learning process. It aims to facilitate learning for individuals to develop and grow, which will lead to working to their full potential. Problem-based learning (PBL) is a teaching model to develop the quality of learning for learners. It makes learners develop skills in analytical thinking, problem-solving, and creative thinking. They can seek knowledge by themselves from both internal and external learning resources, leading to developing skills in analytical thinking and systematic thinking, critical thinking, along with teamwork and building good relationships among team members of learners. This can develop learners to have key characteristics according to the Thai Qualifications Framework for Higher Education (TQF: HEd) in Nursing Science in all aspects and it is a strategy to prepare learners to be graduate nurses who are expected to be able to think, solve problems, think systematically, work with the health team, have creativity, communication skills, adaptation skills, listening to the feelings of service recipients and working with others in the health team, and provide holistic nursing care based on caring.[11]

The Faculty of Nursing, St. Teresa International University designed a targeted teaching and learning program to develop graduates with desirable graduate characteristics as specified by the curriculum and has constantly monitored the characteristics at the end of every academic year. It was discovered that in the academic year 2022, second-year nursing students retained a moderate level of critical thinking competence (a mean of 4.29). In the academic year 2023, the Department of Pediatric and Adolescent Nursing believed that problem-based learning that encourages learners to practice and face problems by themselves would allow learners to practice their cognitive skills, such as critical thinking, analytical thinking, synthetic thinking, and creative thinking. The nursing institution employed it, resulting in greater nursing problem-solving abilities. Therefore, problem-based learning has been employed in teaching the Pediatric and Adolescent Nursing Course with second-year students who are starting to study nursing courses on neonatal nursing. Since neonatal nursing is complicated, especially in cases where infants have complications or underlying diseases, they require specific and delicate care. A small mistake can affect the infant's life or development in the long term. Therefore, effective problem-solving skills are required.[12] The instructors create situational inquiries that stimulate thinking and the desire to find answers that are suitable for beginners in nursing and experiment with setting learning objectives for students. A manual for instructors and students is provided. Instructors and students are prepared by introducing problem-based learning (PBL) to create a common understanding in the learning process. During the process, the instructors discuss and solve problems together to develop systematic thinking, critical thinking, teamwork, and building good relationships among team members at the end of the learning process. Therefore, the researcher is interested in studying the development of knowledge and the ability to solve problems in neonatal nursing with critical thinking by problem-based learning so that learners can solve problems with reason, learn by themselves, and integrate knowledge from theory into practice.

Methods

This was quasi-experimental research with a one-group pre-posttest design. The study was conducted among 114 second-year nursing students of St. Teresa International University who studied the Children and Adolescent Nursing Course in the academic year 2023.

The population was 114 second-year nursing students at St. Teresa International University, in the first semester of the academic year 2023. The sample inclusion criteria included enrolling in the children and adolescent nursing course and giving consent to participate in the research. For withdrawal, a participant can request to withdraw from the research. The sample consisted of 114 people which is the entire population.

Research instruments

Part 1: Instruments in the Experiment

1) The problem-based learning manual for Chapter 6: Neonatal Nursing on Children and Adolescent Nursing Course was developed by the research team based on the instructor's manual for problem-based learning for nursing colleges under the supervision of Praboromarajchanok Institute for Health Workforce Development13, consisting of course description, problem-based learning management steps, instructor roles, learner roles, and evaluation. Problem-based learning was divided into 3 sessions and 7 steps: Session 1: problem setting with 4 steps: presenting the problem, identifying and analyzing the problem, setting hypothesis, and specifying

learning objectives; Session 2 with 1 step: self-study; and Session 3: solving the problem with 2 steps: summarizing concepts or principles, problem-solving methods, presenting study results, and evaluating results.

2) The learning plan for problem-based learning was developed by the researcher by studying textbooks and documents and related literature review, consisting of content about neonatal nursing and a situation that required solving neonatal nursing problems.

Part 2: Data Collection Instruments

General information questionnaire for nursing students, including gender and cumulative GPA.

2) The knowledge and ability to solve problems in neonatal nursing with critical thinking assessment form developed by the researcher based on textbooks and literature review is a situational question to develop knowledge, analytical thinking skills, and ability to solve problems in neonatal nursing through critical thinking, analyzing situations, and appropriate decision-making to provide safe and effective care for newborns. This is a situational test with 30 multiple-choice questions. The scoring criteria are: 1 point for a correct answer and 0 point for an incorrect answer. The scoring criteria are divided into 3 levels: low knowledge and ability to solve problems in neonatal nursing with critical thinking (0-14 points), moderate knowledge and ability to solve problems in neonatal nursing with critical thinking (15-22 points), and high knowledge and ability to solve problems in neonatal nursing with critical thinking (23-30 points).

Research Instrument Quality

Content Validity

The research instruments include a problem-based learning manual, a problem-based learning plan, and a critical thinking assessment form for knowledge and ability to solve neonatal nursing problems developed based on textbooks, documents, and related literature review to examine the content validity, consistency, and appropriateness of the language by 3 experts: 1 lecturer from the Faculty of Education, 1 lecturer in pediatric nursing, and 1 lecturer in mental health and psychiatric nursing. Then, the index of item objective congruence (IOC) was calculated using a criterion greater than or equal to 0.67-1.00[14], resulting in an IOC value of 0.67-1.00 for a critical thinking assessment form for knowledge and ability to solve neonatal nursing problems. The content and language were revised according to the feedback provided by the experts.

Reliability

The assessment form of knowledge and ability to solve neonatal nursing problems with critical thinking, which had been tested for IOC, was brought to try out with 30 third-year nursing students who had already taken the children and adolescent nursing course. Then, the data were employed to calculate the reliability of Cronbach's Alpha Coefficient, using a criterion of more than 0.7[14], resulting in the .88 reliability of the Cronbach's Alpha Coefficient of the assessment form of knowledge and ability to solve neonatal nursing problems.

Participant ethical protection

The researcher submitted the research proposal and instruments to the Human Research Ethics Committee of St. Teresa International University. Once approved (Research Ethics Code STIC-S 052/2566), the researcher started the data collection process by meeting the sample group and explaining the research objectives, research methods, research period, and rights protection of the sample group. The researcher gave the participants a document explaining the research and a consent form. Acceptance or refusal to participate in the research depends on their willingness. The researcher will have the sample complete an assessment form for knowledge and ability to solve neonatal nursing problems with critical thinking before and after using problem-based learning. The sample can withdraw from the research throughout the research period, and this shall not affect the learning outcomes in the Children and Adolescent Nursing Course. The data of the research participants shall be kept confidential for 1 year. The researcher presents the overall picture for academic purposes only. All data shall be destroyed immediately after the research is published.

Experiment Steps and Data Collection

1) The research team met the sample group, introduced themselves, explained the details of the objectives and steps in data collection, and executed the rights protection of the sample. The research team then gave out general information forms and an assessment form of knowledge and ability to solve neonatal nursing problems with critical thinking, before learning by using problem-based learning as a pre-test.

2) The research team gave the problem-based learning manual on Chapter 6 Neonatal Nursing to the sample and the

instructors for mutual understanding before learning. Then, the research team explained the learning objectives and the steps of problem-based learning in 3 sessions with 7 steps. The sample group was divided into 4 groups, 28-29 people per group, organized by student number. Each group had 1 instructor and the students set the group rules.

In week 1, the first activity was conducted: setting the problem. The instructor gave case studies to each sample group. The sample groups were asked to help each other understand the problem, identify the problem issues, analyze them, identify data related to the problem and discuss with each student's prior knowledge, set hypotheses, and identify knowledge that needed to be studied further and prioritize and set learning objectives.

In week 2, the second activity was conducted: self-study. The instructor had the sample groups study by themselves and exchange the knowledge gained within the group independently to meet the specified learning objectives.

In week 3, the instructor assigned the sample group to summarize the main ideas of the content and learning experiences, the principles and concepts from problem-solving, discuss, exchange knowledge gained from research which is consistent with the learning objectives, plan to solve problems from the situational questions, reflect together, and make a report summarizing the learning outcomes as a concept mapping.

In week 4, the third activity was conducted: solving the problem. The instructor assigned the sample groups to present their approaches to solving the problem, exchange knowledge, and reflect on and evaluate the outcome. The learning was conducted using problem-based learning for 3 hours each session for a total of 12 hours.

3) The researchers gave a questionnaire to measure and evaluate the knowledge and ability to solve neonatal nursing problems with critical thinking after learning by using problem-based learning as a post-test.

4) The researchers examined the data collected from the sample groups for completeness and analyzed the data statistically.

Data analysis

The data analysis for this study was conducted using Statistical Package for Social Sciences (SPSS) version 26 with a statistical significance of .05 level as follows; The sample's general information was analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation) to explain the demographic characteristics of the sample and the study variables. The comparative analysis of the mean scores of the knowledge and ability to solve neonatal nursing problems with critical thinking before and after using problem-based learning was conducted by paired t-test statistics.

Results

The sample students had an overall mean score of knowledge and ability to solve neonatal nursing problems with critical thinking before problem-based learning of 13.07 (SD=2.78) (Range 8-21) and after using problem-based learning of 18.73 (SD=1.89) (Range 14-24).

The analysis results after using problem-based learning when comparing the mean scores of the knowledge and ability to solve neonatal nursing problems with critical thinking using the Paired t-test revealed that students had a higher mean score of knowledge and ability to solve neonatal nursing problems with critical thinking overall than before using problem-based learning with statistical significance of .05 (t = 19.882, *P*-value < .001) (Table 1).

Table 1 Comparisons of mean scores of knowledge and ability to solve neonatal nursing problems (N = 114).

	Mean (SD)	Actual range	Possible range	df	t	P-value*
Before	13.07 (2.78)	8-21	5-25	113	19.882	< 0.001
After	18.73 (1.89)	14-24	5-25	113	19.882	

* Paired t test.

Discussions and Conclusion

In this research, the research results were discussed according to the research hypothesis as follows. For problem-based learning in neonatal nursing problem-solving in the Children and Adolescent Nursing Course, nursing students had higher mean scores of knowledge and ability to solve neonatal nursing problems with critical thinking than before using problem-based learning since the research team developed the question using newborn patient situations in line with real situations as a stimulus for learners to learn, allowing them to analyze the cause of the problem and data according to real conditions by studying and researching data by themselves, and linking the problem with knowledge using reasoning to solve patients' problems. This stimulated learners to be curious and enhanced their thinking process to solve problems properly. Unlike lecturing, which does not support

analytical thinking and problem-solving skills, resulting in less critical thinking among learners, problem-based learning is employed to assist learners in developing new knowledge and like them to their existing knowledge. This process consists of 7 steps: in Session 1: problem setting, 1) identifying the problem of the given situation; 2) analyzing the cause of the problem and connecting the problem from current knowledge; 3) setting a hypothesis that is the cause of the problem and prioritizing the problem; 4) developing learning objectives to solve problems; in Session 2: self-study, 5) studying by themselves; in Session 3: solving the problem, 6) summarizing the principles, the content, and the concepts gained from problem-solving, using the knowledge gained to prove the hypothesis and solve the problem; and 7) summarizing the knowledge gained for higher learning achievement of the learners, resulting in a higher level of systematic and clinical thinking.[16,17]

The results revealed that the students had a mean score of the knowledge and ability to solve neonatal nursing problems with critical thinking after using problem-based learning in the Children and Adolescent Nursing Course higher than before using problem-based learning ($t=19.882$, P-value $< .001$). For discussion of research results, the knowledge and ability to solve neonatal nursing problems with critical thinking from problem-based learning can be enhanced with challenging problems that are consistent with the objectives and real situations. The instructor is a facilitator, organizes the learning atmosphere, prepares learning resources, facilitates the learners to learn, stimulates the learners to develop their learning, seeks knowledge and related skills, and thinks analytically. The learners participate in learning among group members as a team, create good relationships, exchange knowledge between experts and learners, develop problem-solving thinking and decision-making, and enhance responsibility among the learners.[4] Learners must collect, and analyze data according to real situations, identify problems and causes from the obtained data, link knowledge and experience to solve problems, and correctly employ concepts and principles to solve neonatal nursing problems in line with the specified situations. Since problem-based learning allows learners to find methods for solving problems in given situations and identify obstacles and success factors affecting problem-solving. They could identify safe and quality outcomes in nursing services, allowing them to employ data and evidence to refer to and solve problems critically. Self-study stimulates learners to employ advanced thinking processes, think systematically, understand problems and situations, and foster critical thinking. Critical thinking would allow nursing students to make decisions in the clinic and practice problem-solving skills using the nursing process to apply knowledge to practice in real situations and promote learners to learn throughout their lives.[13,15] This is consistent with the study of Kanchanathat Thongmuangthanathep et al. (2018)[9] and Naphaporn Phutthiwanit et al. (2020)[6] discovering that Problem-based learning for nursing students could enhance skills in analytical thinking, problem-solving, and critical thinking so that they could apply their knowledge to nursing practice effectively. This is consistent with Nutchanad and Chernin (2020)[16] who uncovered that problem-based learning could develop professional knowledge and problem-solving skills. Therefore, it can be concluded that problem-based learning designed by the researcher can enhance critical thinking for nursing students.

Regarding problem-based learning in this research from classroom observations, it was found that in the beginning, learners could not identify the problem directly, lacked systematic thinking skills, and data, or could not systematically analyze and synthesize data. The instructor must ask questions and guide how to think so that they can identify the problem directly, plan data collection, and apply theory to problem-solving in each situation. This skill is a part of using the nursing process to solve problems systematically. This allows nursing students to analyze and synthesize knowledge by themselves, leading to a deep understanding of knowledge to link previous knowledge to new knowledge, and developing a rational understanding through case studies in real life, which is a strategy for developing rationality and self-learning. Learners create knowledge by themselves. Learning is a search for new knowledge, where learners learn from problems and situations that are specifically designed and established. Problems are the foundation of the learning process and a stimulus for developing problem-solving skills with reason and searching for information to understand the problem, including problem-solving methods. Problem-based learning focuses on developing learners in terms of skills and learning processes to be able to learn by self-guidance to practice building knowledge through the thinking process by solving problems that are meaningful to the learners. In a study of Sireewat Ar-yuwat (2017)[7], problem-based learning was employed in the Family and Community Nursing 2 Course

in the fourth-year students on community health problem analysis and problem-solving in the fourth-year students, and it was discovered that 66.2 percent of them agreed that problem-based learning delivered an opportunity for students to learn by themselves, making them remember the content and apply the knowledge. Therefore, it is sustainable learning. Tassanee Trisayaluk and Bamphen Phongphetdit (2018)[8] studied the learning outcome in practice by analyzing case examples and focusing on reflecting ideas from problems solved to analyze decision-making approaches. Learning comes from judgments based on correct principles and theories. It was found that nursing students could solve nursing problems with better critical thinking skills and are more satisfied in their studies.

The ability to solve nursing problems with critical thinking is necessary for nursing students. Problem-based learning motivates students to learn and solve problems through seeking knowledge and learning from self-discovery and working in groups, thinking and deciding to solve problems correctly and appropriately, and using knowledge from theory to solve problems in each situation. This is a part of using the nursing process to solve problems systematically. Therefore, instructors should choose an appropriate teaching model for the course and/or employ a combination of teaching methods so that students who will be registered nurses can utilize it to provide effective health services to service recipients.

In this research, the researcher and the instructor were in the same group, which may affect the results of the students' assessment forms. Even though the researcher informed the students or sample group that there was no impact on the scores in the course, the number of instructors who use problem-based learning should increase, and the researcher is only a part of the total number of instructors.

References

1. Supanee S, Walla T. Guide to accreditation of Nursing and Midwifery educational institutions for educational institutions with Bachelor of Nursing Science Program Graduates, revised 2020. Bangkok: Golden Point Printing, 2020: pp.20-23. (in Thai)
2. Bellanca J, Brandt R, editors. 21st Century Skills: Rethinking How Students Learn. Bloomington: Solution Tree Press, 2010: pp.83-93.
3. Trilling B, Fadel C. Learning and innovation skills. 21st Century Skills Learning for life in our times. San Francisco: Jossey-Bass, 2009: pp. 49-54.
4. Thabet M. Effect of Problem Base Learning Management on Critical Thinking Skills of Nursing Students. The Influence of Problem Based Learning on Critical Thinking Skills of Nursing Students. Journal of Nursing and Education 2017;5(2):32-45. (in Thai)
5. Napaporn P, Surasak P, Marisa S, Orathai K. Effect of Problem-Based Learning on Intellectual Skills of Nursing Student in Nursing of Persons with Health Problems I Subject. The Southern College Network Journal of Nursing and Public Health 2017;4(1):1-14. (in Thai)
6. Napaporn P, Surasak P, Arisa C. Learning Management Guidelines for Using PBL with Nursing Students. The Southern College Network Journal of Nursing and Public Health 2020;7(2):324-335. (in Thai)
7. Sireewat Ar-yuwat. Problem-Based Learning (PBL): The Challenges of Nursing Education to Foster The 21st Century Learning. Nursing Journal of the Ministry of Public Health 2018;27(2):15-29. (in Thai)
8. Tassanee Trisayaluk. Effect of Using Case Analysis Method in Clinical Teaching Towards Happiness in Learning and Critical Thinking Skills among Nursing Students. The 10th NPRU National Academic Conference Nakhon Pathom Rajabhat University Nakhon Pathom Thailand 29 - 30 March 2018.
9. Kanjananat Tongmuangtunyatep. The Effects of Using Problem- Based Learning for Caring on Maternal and Fetus with Health Problem Related with Pregnancy of 4th Level Nursing Students. Journal of Nursing and Education 2018;11(2):87-97. (in Thai)
10. Rogers C. Freedom to learn for the 80's. New York: Merrill Publishing Company, 1983.
11. Nutchanad B, Chernin T. Nursing Learning Management By Using Problem-Based Learning(PBL): The Challenges or Pitfalls for Nurse Instrutors. Journal of MCU Nakhondhat 2020;7(10): 57-70. (in Thai)
12. Potts, N.L.,& Mandleco, B.L. Pediatric Nursing: Caring for Children and Their Families.(3rded). Australia: Delmar Cengage Learning, 2012.
13. Instructors of Boromarajonani Institute.Teaching and Learning Manual for Problem-Based Learning in Boromarajonani college of nursing. Nonthaburi: Yutarin press, 2015. (in Thai)
14. Polit DF. Hungler JB. Nursing research: Principles and methods. Philadelphia: JB Lippincott, 1999: pp.417-419.
15. Kiatkamjorn K, Kamlai S, Chanchuri T, Thunwalai H. Effects of Problem-based Learning to Enhance Learning Outcomein Accordance with Thai Qualifications Framework for Higher Education of Nursing Students in the Subject of Leadership and Nursing Management. Journal of Nursing and Education 2017;10(3):39-55. (in Thai)
16. Nutchanad B, Chernin T. Nursing Learning Management By Using Problem-Based Learning(PBL): The Challenges or Pitfalls for Nurse Instrutors. Journal of MCU Nakhondhat 2020;7(10): 57-70. (in Thai)
17. Kanjana S, Saisamorn C. Critical Thinking of Nursing Students. Journal of Royal Thai Army Medical 2017;70(3):169-174. (in Thai)
18. Daley B. J, Morgan S, Black S. B. Concept maps in nursing education: A historical literature review and research directions. Journal of Nursing Education 2016;55(11):631-639.
19. Kilroy D. A. Review problem base learning. 2017. (Accessed on May. 27, 2017, at Retrieved from http://www.emj.bmj.com)
20. Prawida P, Suphattra C, Soontaree K, Saowalak S. Effect of Problem-based Learning Approach in Nursing Care of Person with Mental Health Problems Subject on Cognitive Skills of Nursing Students. Journal of Phrapokklao Nursing College 2020;31(2):73-87. (in Thai)