STUDY PROTOCOL

Exploring a learning model for knowledge integration and the development of critical thinking among nursing students with previous learning: a qualitative study protocol

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Abstract

Students often struggle to apply their knowledge of bioscience to their care practice. Such knowledge is generally learned through remembering and understanding, but retention quickly fades. They also experience difficulty progressing to higher-order cognitive skills such as applying, analyzing, evaluating, and even creating, which are necessary to develop soft skills, such as critical thinking, in the care profession. In order to improve existing programs, there is a need to better understand students' prior learning experiences and processes. The proposed study will explore the previous learning experiences of nurses enrolled in a two-year nursing program at a Taiwan university and identify the challenges they face in integrating multidisciplinary knowledge and developing critical thinking competency. The study will adopt a constructivist grounded theory methodology to collect interview data. The findings are expected to improve higher cognitive learning performance and inform the revision of the two-year nursing curriculum.

Keywords Knowledge integration, Critical thinking, Constructivist grounded theory, Undergraduate nursing students, Learning model

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Introduction

In nursing education, theoretical knowledge focuses on human body systems and is primarily or often imparted through lectures. This mode of teaching–learning results in a separation between theoretical knowledge and clinical practice. As a result, it is difficult for students to connect these two domains, and they often struggle to integrate these two types of knowledge in a care scenario. Nursing curricula aimed at basic medicine and applying it to nursing care learning. For instance, knowledge of biosciences such as physiology or pharmacology is not repeated in courses like Adult Nursing. In Bloom's cognition hierarchy of learning [1], learning outcomes are primarily set in relation to remembering and understanding rather than higher-order outcomes such as applying or analyzing. Since knowledge retention fades over time [2], students may be unable to adequately apply academic

Lin *et al. BMC Medical Education*   (2024) 24:1140

Page 2 of 7

knowledge when faced with complex health issues in individual cases.

In technical and vocational education in nursing, the curricula's learning outcomes are based on three types of objectives—cognitive, affective, and skills-based—equivalent to remembering, learning attitude, and techniques in Bloom's taxonomy [3]. If learning continues with constant practice, it is possible to achieve learning outcomes at a proficiency level. However, the acquired knowledge may gradually fade if learning is not continued. This could result in missed opportunities to achieve higher-order cognitive learning, such as the ability to analyze or create [2]. Additionally, prior knowledge may be difficult to internalize, and unfamiliar skills may become challenging to acquire.

The educational goals of the technical and vocational systems are likely to play a role in determining whether learning continues after graduation. Nursing students in junior college are expected to pass a national qualification examination and enter the workplace immediately afterward, meaning their cognitive, affective, and skills learning will continue to develop. They will advance to a higher level of learning performance. However, students who pursue a higher degree may lack extrinsic learning motivation, and these abilities may stagnate or regress. Continuing nursing education programs such as 2-year programs can improve students' extrinsic learning motivation and transform it into intrinsic learning motivation, which leads to improved internalization and integration of knowledge and enhanced critical thinking skills [4, 5]. A better understanding of students' prior learning experiences and processes is necessary to make appropriate revisions to the curriculum.

Memorization and understanding of learning concepts are essential for accumulating knowledge. However, merely holding onto this knowledge can weaken nursing graduates' critical thinking and problem-solving abilities [6]. While nursing graduates with associate degrees possess strong theoretical understanding, they are often unable to apply this knowledge to a holistic consideration of the circumstances of individual patients, relying instead on managing their patients' symptoms and practitioners' prescriptions. The consequences are less effective patient care and a devaluation of nursing professionalism.

In summary, nursing students are limited in their theoretical knowledge and critical thinking development, which hinders their ability to perform comprehensive evaluations of patients and make effective clinical care decisions. This gap between learning and practice could be addressed through further education that equips students to integrate and apply multidisciplinary knowledge to the practical care domain. To this end, the proposed study seeks to identify the factors that affect how students integrate academic knowledge to improve critical thinking and overall learning satisfaction, as Chang et al. [7] recommended. Such information is needed to inform the revision of the two-year nursing program curriculum.

Literature review
Learning models and knowledge integration
The ability to synthesize knowledge is fundamental in all health professions, including nursing [8]. Competent nurses require theoretical knowledge of biosciences and care practice to make complex patient management decisions. Quality care depends on nurses' ability to combine clinical reasoning (critical thinking) with accurate health information in real-time situations. Nursing education should aim to bridge the gap between theoretical concepts learned in classrooms and their practical application in clinical settings [9].

Nursing education fosters the development of complex knowledge and soft skills, known as core nursing values or competencies [10]. A scoping review conducted by Widad and Abdellah [11] identified various soft skills that should be included in the nursing curriculum and concluded that different teaching and learning strategies were required to enhance these skills. Other researchers have emphasized the centrality of effective learning with a learner-centered approach that encourages active participation in learning and an interdisciplinary model for integrative learning [12].

To date, a number of innovative teaching methods have been found to improve learning effectiveness. Kou [13] proposed a reward-learning model that focuses on how extrinsic rewards motivate individuals to engage in knowledge-acquisition behavior, noting that learning involves explaining and strengthening one's information-seeking behavior. Collaborative learning has improved cognitive integration or combining knowledge from multiple disciplines [8]. Challenge-based learning is a collaborative approach that encourages students to engage in multidisciplinary learning and take action to solve challenges [14]. Problem-based learning (PBL) has been shown to enhance students' critical thinking and self-directed learning for long-term knowledge retention [15]. For instance, Gao et al. [16] reported that an approach that combined mind mapping with PBL improved undergraduate nursing students' theoretical knowledge, practical abilities, and self-learning skills. In contrast, Manuaba et al. [17] concluded from their study that the PBL approach did not appear to improve critical thinking and problem-solving skills compared to the conventional teaching method. Another model, inquiry-based learning (IBL), has been identified as equipping students with the ability to investigate and solve problems [18]. Finally, a flipped classroom teaching model has been proposed as

Lin *et al. BMC Medical Education*   (2024) 24:1140

Page 3 of 7

an effective way of supporting students to develop high-level cognitive skills [19], develop their critical thinking [20], and improve their motivation and interactions. The flipped classroom teaching model is a form of blended learning that centers around students and reverses their learning activities in groups while in class.

Critical thinking in nursing

According to Benner [21], the traditional classroom approach to teaching and learning theoretical knowledge needs to be transformed into one that focuses on cultivating learners' critical thinking and clinical judgment abilities to bridge the gap between theoretical knowledge and clinical practice. Similarly, Gonzalez et al. [22] argue that understanding the connection between learned knowledge and the clinical situation is crucial for developing critical thinking skills. Such understanding allows the learner to apply clinical decision-making abilities to the care situation. In other words, learners must integrate their knowledge, critical thinking, clinical reasoning, and clinical judgment skills into clinical practice. This learning method draws on various disciplines to help learners develop logical and critical thinking skills while eliminating the monotony of academic learning.

Critical thinking refers to the cognitive process of exploring existing information and analyzing available information to assist in judgment and decision-making. In simpler terms, critical thinking involves an individual's use of logical thinking to regulate their thoughts. As such critical thinking involves several skills, such as interpretation, reasoning, evaluation, self-regulation, analysis, and inductive and deductive logical reasoning [23]. The process enables individuals to thoughtfully consider information from the real world, construct questions, and bridge the gap between theory and practice. Demonstrating critical thinking skills is a significant component of professional practice in nursing [24]. Nursing can be regarded as a cognitive process in which critical thinking is necessary to gather information, make clinical decisions, and solve complex and diverse clinical health problems in individual cases. Accordingly, critical thinking is essential to developing care competencies at every stage of the nursing process. Consequently, reasoning or critical thinking has become a central component of nursing education [25].

There is a close relationship between critical thinking and deductive and inductive logic. Deductive and inductive reasoning are two distinct forms of logical thinking. Deductive reasoning starts from general concepts and reasons toward specific conclusions, whereas inductive reasoning draws conclusions from specific observations and infers general principles. Both types of reasoning play a crucial role in critical thinking [26], but their processes and outcomes differ. In the classroom, deductive logic learning explains the theoretical principles of the course content and demonstrates their application to situations. This kind of learning helps students acquire theoretical knowledge and connects various concepts to form a series of logical theoretical understandings. Concept mapping is an example of this approach. Inductive logic learning, on the other hand, can help students develop a deeper understanding of the concepts, which enables them to think more critically about what they have learned. This results in more comprehensive and long-lasting knowledge that is not based merely on memorization, which can have a negative effect on problem-solving skills. Therefore, incorporating deductive and inductive logic strategies in teaching can enhance learners' conceptual understanding and problem-solving abilities [27].

Critical thinking is usually associated with logical thinking, problem-solving, and critical reflection [28]. Although these abilities are all related to building convincing arguments and enhancing thinking skills, they have important differences. Critical thinking focuses on uncovering the essence of things, with an emphasis on achieving a comprehensive understanding at the cognitive level. It is characterized by carefully collecting relevant information and objectively evaluating a phenomenon or state. It involves exploring and reconsidering the problem to avoid subjective biases and seek the most accurate factual situation. It seeks to present diverse views and positions on events, emphasizing logical and rational judgment. In contrast, critical reflection involves introspection and self-reflection. It emphasizes self-criticism and aims to identify right and wrong courses of action [29]. As a result, critical thinking is often considered an essential thinking skill for practice. Both reflection and critical thinking have been identified as essential nursing skills for appropriate patient care. Despite these conceptual and operational differences, critical thinking and reflection share many commonalities and can impact each other's development [30]. These include analysis, interpretation, evaluation, reasoning, information searching, logic, cognitive processes of reasoning, and knowledge translation, all of which are necessary for making well-considered clinical professional decisions. Clinical decision-making plays a crucial role in ensuring safe patient care, and critical thinking is a vital cognitive process for clinical decision-making. Accordingly, critical thinking is vital in clinical nursing practice. However, there is a lack of clarity around the most effective teaching–learning methods to foster problem-solving and critical-thinking abilities in students [31].

In summary, continuous improvement in students' inductive and deductive logical reasoning skills is

Lin *et al. BMC Medical Education*   (2024) 24:1140

Page 4 of 7

necessary to cultivate higher-order cognitive skills, such as critical thinking. The application of critical thinking in professional disciplines involves the cognitive processes of academic application, analysis, evaluation, and creation. This conceptual process is vital for clinical decision-making and safe patient care. Among the various learning strategies that have been proposed to cultivate students' problem-solving and critical thinking, there is broad agreement that critical thinking awareness (awareness) and reflection ability (reflection) are important components [32, 33].

Academic self-efficacy and knowledge integration

The proposed study employs the concept of learning self-efficacy, which has been used to indicate the effectiveness of learners' ability to integrate theoretical knowledge. According to Bandura [34], self-efficacy refers to an individual's belief in their ability to perform a task and achieve a goal. Four factors influence self-efficacy: mastery experience, vicarious experience, verbal persuasion, and psychological and affective states. Individuals confident in their abilities are more likely to persevere and work hard until they succeed, regardless of the task's difficulty. As a result, self-efficacy beliefs are considered predictors, mediators, or moderators of task completion [35, 36].

Learning self-efficacy refers to students' belief in their ability to achieve their learning goals and demonstrate their effectiveness in learning. Those who possess high learning self-efficacy show positive motivation towards learning even when faced with difficulties, and they persist in their efforts to solve problems. On the other hand, when students with low learning self-efficacy encounter learning difficulties, they hesitate and lack the motivation to resolve the issues. Bulfone et al. [35] reported that most students' learning self-efficacy remained relatively stable. However, those with increased learning self-efficacy demonstrated improved learning motivation and problem-solving skills. Previous research has used learning self-efficacy to predict learning motivation [37] and learning effectiveness [36]. The results indicated that higher learning self-efficacy was associated with stronger self-directed learning ability, more psychologically safe learning, and more positive learning results, demonstrating learning resilience. Basith et al. [36] found that academic achievement was positively related to learning self-efficacy; students with strong beliefs in their learning abilities were more likely to act to achieve their learning goals. As a result, they were more likely to pass examinations, improve their academic performance, and achieve their learning objectives. The findings also found that individuals with lower learning self-efficacy were more likely to experience emotional breakdown when faced with learning pressure. Gulley et al. [38] found a positive correlation between learning self-efficacy and performance on national licensure exams, indicating that students with high self-efficacy are more likely to learn effectively and successfully.

Overall. The research findings indicate that motivation, learning self-efficacy, and effectiveness are interdependent. Enhancing learners' intrinsic motivation can increase learning achievement [39]. At the same time, learning self-efficacy has the potential to predict both learning motivation [37] and learning effectiveness [36]. The relationship between intrinsic motivation, learning self-efficacy, involvement, and effectiveness is mutually reinforcing. Each factor has an impact on the others. According to Dunn and Kennedy [37], there is a positive correlation between intrinsic motivation and self-efficacy, which, in turn, predicts students' learning involvement. Moreover, learning involvement is an indicator of students' learning achievement. Therefore, enhancing learning self-efficacy can foster learning motivation and effectiveness [36].

Aim and objectives

The proposed study aims to identify the factors that influence the integration of multidisciplinary knowledge and the development of critical thinking among undergraduate nursing students in two-year programs. The specific objectives are to (1) document the learning experience of undergraduate nursing students in their previous Junior Nursing College, (2) develop learning opportunities that effectively incorporate knowledge integration, and (3) identify learning needs for the development of critical thinking skills.

Methods
Study design
Charmaz's constructivist grounded theory (CGT) [40] will underpin the study design. CGT is a method derived from traditional grounded theory that focuses on group experiences rather than individual experiences by focusing on understanding interactions, processes, and events. It aims to generate concepts and ideas based on a distinction between reality and truth. This means that researchers manage their constructions and interpretations of the participants' constructions and interpretations, and the results are contextualized. The theoretical concepts of a constructivist approach serve as interpretive frameworks and offer an abstract understanding rather than a theory for explanation and prediction. Knowledge is, therefore, created and constructed during the research process. In the proposed study, therefore, CGT is considered an appropriate method for an inductive exploration and

Lin *et al. BMC Medical Education*   (2024) 24:1140

Page 5 of 7

analysis of the complex learning process in the context of undergraduate nursing education.

CGT will explore nursing students' previous learning experiences and the challenges affecting their ability to integrate multidisciplinary knowledge and critical thinking competency. The study design will be based on the five key elements in this methodology for developing lesson plans: (1) The theoretical framework will inform the sampling strategy. (2) Study participants will be able to provide rich information on the phenomenon under investigation. (3) Data collection and analysis will proceed simultaneously until saturation as a sufficient sample size is achieved [41]. (4) Data collection may be modified as theoretical insights emerge. (5) continuous data collection, analysis, and integration will occur. These five elements will be deployed to explore the nursing learning process and identify the factors influencing integrating multidisciplinary knowledge and critical thinking development.

Study site
Chang Gung University of Science and Technology has two northern and southern Taiwan campuses. The study will be conducted at both campuses, with a total student population 6,100. This includes 4,300 students undertaking four- and two-year nursing programs at the baccalaureate level. Both campuses have an annual enrolment of nearly 1,000 students in the two-year nursing program. This study will recruit participants from two-year nursing programs who completed their five-year study in nursing with a diploma degree obtained, already have a nursing license, and could practice in clinical settings. However, they all wish to study further to get a bachelor's degree.

Sampling
A theoretical and purposive sampling strategy will be used to recruit participants for the study. To be eligible for the study, potential participants must meet the following criteria: (1) aged 18 years or older, (2) currently enrolled in the Evaluation and Analysis of Adult Nursing Cases course, and (3) be willing to participate in face-to-face interviews that will be audio-recorded. Potential participants will be excluded if they (1) withdraw from the Evaluation and Analysis of Adult Nursing Cases course, (2) have prior clinical nursing experience, and/or (3) have a non-nursing academic background in Junior Nursing College.

Data collection
The primary investigator (PI) will conduct all interviews. A semi-structured interview guide format will be used to ensure both consistency and flexibility in data collection. The interview guide will also maintain focus and avoid bias toward the researcher's specific areas of interest. Interviewing in the participants' and interviewers' common language will maximize data quality. Sharing the same nursing background and language will facilitate an in-depth understanding and interpretation of verbal and non-verbal cues and maximize data quality. With participants' permission, interviews will be audio-recorded to ensure accuracy. Participants will be encouraged to share their perspectives and experiences of previous academic studies.

Data management and analysis
The interviews will be transcribed verbatim. The transcripts and audio recordings will be coded under the same filename. The audio recordings will be listened to repeatedly to gain a deeper insight into the data, and the transcripts will be read line-by-line to obtain a sense of the text's whole meaning. Constant comparative data analysis will be performed to focus interviews on the subsequent process of theoretical sampling to develop the properties of categories until theoretical satisfaction. All transcripts will be carefully read several times and systematically coded using open coding. They will then be read again, and any keywords or phrases relating to the issues under investigation will be captured in the participants' own words. The PI will undertake preliminary data analysis, and the results will be discussed with the study team to obtain consensus on the emerging interpretation.

Study rigor
The quality of the study will be evaluated based on its credibility, originality, resonance, and usefulness [42]. Credibility is ensured by having the primary author conduct all interviews to maintain consistency and quality. Credibility will be enhanced through purposive and theoretical sampling, audit trail techniques, member checking, and thick and rich descriptions. The research team will meet frequently to reach a consensus on identifying codes and categories and the process of theoretical sampling. The originality of the findings will be demonstrated in the use of verbatim quotes in the report and continuous searching of the literature. Resonance will be achieved by identifying categories that provide in-depth insights, and interviews will be recorded and transcribed accurately to provide thick and rich data. Furthermore, a nursing educator will read data from the coding process and report on the study. The study's usefulness will be evaluated as follows: sole interviewer, audit trail, and a better understanding of nursing students' learning difficulties in integrating knowledge and developing critical thinking skills.

Lin *et al. BMC Medical Education*   (2024) 24:1140

Page 6 of 7

Ethical considerations

Once organizational permission to conduct the study has been obtained from the university, participants will be recruited via an invitation to the school email system. The email will explain the importance of the study and invite students to participate in face-to-face semi-structured individual interviews. Only the PI will conduct an open-ended and in-depth interview with individuals.

Potential participants will receive an invitation via the university's email system. Potential participants who demonstrate interest in participating will receive an information sheet and consent form and be given time to read and consider the information. The participants will be fully informed about the study, including its purpose, the procedures for data collection, potential risks and benefits, time commitment, and how their rights to privacy and anonymity will be protected. An opportunity to ask questions will be given before signing the consent form. Participants will be advised that participation is voluntary and have the right to withdraw from the study without penalty. The decision to participate or not will in no way impact their involvement in the course. No coercive or deceptive tactics will be used to encourage participation. The interviews will be conducted at a time and place of the participant's choosing, but preferably in an independent, safe, and quiet location in the workplace. Before the interview commences, the interviewer will explain the interviewee's rights in relation to their participation, answer any questions, and obtain written consent.

Participants will be assigned a number code. No names or other identifying information will be recorded on the audio records, transcripts, or field notes. No physical risk to the participants is anticipated. Some participants may experience psychological discomfort in reflecting on their experiences during interviews. The risk management plan includes continuous assessment of a participant's level of comfort or anxiety through the interview, and interviews will be terminated and rescheduled if any discomfort or anxiety occurs. Participants will be referred to a free counseling service if this meets their needs. Participants will be informed that they can refuse to answer questions during the interview.

Interpretation

This study employs constructivist grounded theory to investigate how previous learning experiences and perspectives affect nursing students' knowledge integration and critical thinking development.

Limitations

Different universities in Taiwan may have varying criteria for selecting students for enrollment based on their academic achievements in the two-year nursing program entrance system. This study will only be conducted in a single university, based on the institution's goals of nursing student cultivation. Therefore, the findings may not apply to other institutions. Furthermore, the study saturation or theoretical saturation in qualitative studies may not be suitable for this study. Therefore, a sufficient sample size [41] will be used in the current study's data collection and analysis process.

Conclusion

The proposed study will investigate how students' learning experiences during their associate degree in nursing affect their ability to integrate knowledge and develop critical thinking skills. The two-year nursing degree serves as a lead for a bachelor's degree for students with a five-year nursing associate degree. Also, a bachelor's degree in nursing is becoming a standard educational qualification for clinical practice. Accordingly, it is important to ensure that the curriculum design in the two-year program is effective in cultivating students' development of these 'soft' skills to bridge the gap between nursing education systems.

Availability of data and materials
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
The Chang Gung Medical Foundation Institutional Review Board (202301954B0) has approved full ethics.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Lin *et al. BMC Medical Education*   (2024) 24:1140

Page 7 of 7

References

1. Bloom BS, Engelhart MD, Furst E J, Krathwohl DR. Taxonomy of educational objectives: The classification of educational goals. 1956; David McKay
2. Molina-Torres G, Rodriguez-Arrasti M, Alarcón R, Sánchez-Labraca N, Sánchez-Joya M, Roman P, Requena M. Game-based learning outcomes among physiotherapy students: comparative study. JMIR Serious Games. 2021;9(1):e26007.
3. Bloom BS. In: Anderson LW, Krathwohl DR, editors. A Taxonomy for Learning, Teaching, and Assessing: a revision of Bloom's taxonomy of educational objectives, complete ed. New York: Longman; 2001.
4. Vu T, Magis-Weinberg L, Jansen BRJ, Atteveldt NV, Janssen TWT, Lee NC, Maask HLJ, Raijmakers MEJ, Sachisthal MSM, Meeter M. Motivation-Achievement Cycles in Learning: A Literature Review and Research Agenda. Educ Psychol Rev. 2022;34:39–71.
5. Walsh P, Owen PA, Mustaf N, Beech R. Learning and teaching approaches promoting resilience in student nurses: an integrated review of the literature. Nurse Educ Prac. 2020;45:102748.
6. Yeung MM, Yuen JW, Chen JM, Lam KK. The efficacy of team-based learning in developing the generic capability of problem-solving ability and critical thinking skills in nursing education: A systematic review. Nurse Educ Today. 2023;122:105704.
7. Chang CY, Kuo SY, Hwang GH. Chatbot-facilitated nursing education. Educ Technol Soc. 2022;25(1):15–27.
8. Ignacio J, Chen H-C. Cognitive integration in health professions education: Development and implementation of a collaborative learning workshop in an undergraduate nursing program. Nurse Educ Today. 2020;90:104436.
9. Culyer LM, Jatulis LL, Cannistraci P. Brownel CAEvidence-based teaching strategies that facilitate transfer of knowledge between theory and practice: what are nursing faculty using? Teach Learn Nurs. 2018;13(3):174–9.
10. Sancho-Cantus D, Cubero-Plazas L, BotellaNavas M, Castellano-Rioja E, Cañabate Ros M. Importance of Soft Skills in Health Sciences Students and Their Repercussion after the COVID-19 Epidemic: Scoping Review. Int J Environ Res Public Health. 2023;20:4901.
11. Widad A, Abdellah G. Strategies used to teach soft skills in undergraduate nursing education: a scoping review. J Prof Nurs. 2022;42:209–18.
12. Berg C, Philipp R, Taff SD. Scoping review of critical thinking literature in healthcare education. Occup Ther Health Care. 2023;37(1):18–39. https://doi.org/10.1080/07380577.2021.1879411.
13. Kou M. A reward-learning framework of knowledge acquisition: an integrated account of curiosity, interest, and intrinsic-extrinsic rewards. Psychol Rev. 2022;129(1):175–98.
14. Nichols M, Cator K, Torres M. Challenge-based learner user guide. Digital Promise. Redwood City: ENGAGE; 2016.
15. Lund B, Jensen AA. In: Peters MA, editor. PBL Teachers in Higher Education: Challenges and Possibilities. Encyclopedia of Teacher Education Springer; 2020.
16. Gao X, Wang L, Deng J, Wan C, Mu D. The effect of the problem-based learning teaching model combined with mind mapping on nursing teaching: A meta-analysis. Nurse Educ Today. 2022;111:105306. https://doi.org/10.1016/j.nedt.2022.
17. Manuaba IBAP, No Y, Wu CC. The effectiveness of problem-based learning in improving critical thinking, problem-solving and self-directed learning in first-year medical students: a meta-analysis. PLoS One. 2022;17(11):e0277339.
18. Archer-Kuhn B, MacKinnon S. Inquiry-based learning in higher education: A pedagogy of trust. J Educ Train Stud. 2020;8(9):1–14.
19. Betihavas V, Bridgman H, Kornhaber R, Cross M. The evidence for 'flipping out': a systematic review of the flipped classroom in nursing education. Nurse Educ Today. 2016;38:15–21.
20. Nugraheni BI, Surjono HD, Aji GP. How can flipped classroom develop critical thinking skills? A literature review. Int J Inform Educ Technol. 2022;12(1):82–9.
21. Benner P, Sutphen M, Leonard V, Day L. Educating nurses: A call for radical transformation. Jossey-Bass; 2010.
22. Gonzalez L, Nielsen A, Lasater K. Developing students' clinical reasoning skills: a faculty guide. J Nurs Educ. 2021;60(9):485–93.
23. Altun E, Yildirim N. What does critical thinking mean? Examination of pre-service teachers' cognitive structures and definitions for critical thinking. Thinking Skills Creativity. 2023;49:101367.
24. Ilaslan E, Adibelli D, Tesjerecu G, Cura SU. Development of nursing students' critical thinking and clinical decision-making skills. Teach Learn Nurs. 2023;18(1):152–9.
25. Lee DS, Abdullah KL, Chinna K, Subramanian P, Bachmann RT. Critical thinking skills of RNs: exploring demographic determinants. J Contin Educ Nurs. 2020;51(3):109–17.
26. Karlse B, Hillestad TM, Dysvik E. Abductive reasoning in nursing: Challenges and possibilities. Nurs Inq. 2021;28(1):e12374.
27. Wardaini S, Kusuma IW. Comparison of learning in inductive and deductive approach to increase student's conceptual understanding based on international standard curriculum. J Pendidikan IPA Indonesia. 2020;9(1):70–8.
28. Ng SL, Mylopoulos M, Kangasjarvi E, Boyd VA, Teles S, Orsino A, Lingard L, Phelan S. Critically reflective practice and its sources: A qualitative exploration. Med Educ. 2020;54:312–9.
29. Rolfe G, Jasper M, Freshwater D. Critical reflection in practice: Generating knowledge for care. 2nd ed. London: Red Globe Press; 2011.
30. Berg E, Lepp M. The meaning and application of student-centered learning in nursing education: an integrative review of the literature. Nurs Educ Pract. 2023;69:103622.
31. Carter AG, Creedy DK, Sidebotham M. Efficacy of teaching methods used to develop critical thinking in nursing and midwifery undergraduate students: a systematic review of the literature. Nurs Educ Today. 2016;40:209–18.
32. Lin CC, Chen LC, Han CY, Su CC, Huang YL. Exploring the experience of reflective writing among Taiwanese undergraduate nursing students: a qualitative study. J Prof Nurs. 2022;40:105–10.
33. Lin CC, Han CY, Wu ML, Hsiao R, Wang LH, Chen LC. Enhancing reflection on medical and surgical nursing among nursing students: a participatory action research study. Nurs Educ Today. 2021;102:104935.
34. Bandura A. Human agency in social cognitive theory. Am Psychol. 1989;44(9):1175–84.
35. Bulfone G, Badolamenti S, Biagioli V, Maurici M, Macale L, Sili A, Vellone E, Alvaro R. Nursing students' academic self-efficacy: a longitudinal analysis of academic self-efficacy changes and predictive variables over time. J Adv Nurs. 2021;77(5):2353–62.
36. Basith A, Syahputra A, Ichwanto MA. Academic self-efficacy as predictor of academic achievement. JPI (Jurnal Pendidikan Indonesia). 2020;9(1):163–70.
37. Dunn TJ, Kennedy M. Technology enhanced learning in higher education; motivations, engagement and academic achievement. Comput Educ. 2019;137:104–13.
38. Gulley T, Hall T, Newsome A, Sidle MW, Simpson MR. Perceived self-efficacy among nursing students during a pandemic: A pilot study. Teach Learn Nurs. 2021;16:215–9.
39. Lisa U, Andriani F, Ahzaliza D. The effectiveness of online learning on student practicum skills. Adv Soc Sci Educ Humanit Re. 2020;506:204–43.
40. Charmaz K. Constructing grounded theory: A practical guide through qualitative analysis. SAGE Publication Ltd; 2006.
41. Johnson JL, Adkins D, Chauvin S. Qualitative research in pharmacy education: A review of the quality indicators of rigor in qualitative research. Am J Pharmaceut Educ. 2020;84(1):138–46.
42. Charmaz K. Constructing Grounded Theory (2nd ed). SAGE Publications Ltd; 2014.

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