ISSN 1392-0340 (Print)
ISSN 2029-0551 (Online)
https://doi.org/10.15823/p.2025.157.3

Pedagogika / Pedagogy
2025, t. 157, Nr. 1, p. 45–72 / Vol. 157 No. 1, pp. 45–72, 2025

VYTAUTO DIDŽIOJO UNIVERSITETO ŠVIETIMO AKADEMIJA

A Novel Problem-Based Learning Model Incorporating Team Teaching to Enhance Self-Determination in Nursing Students: Development and Validation

Rhona Sandra[1], Firman Firman[2], Abdul Razak[3], Ciptro Handrianto[4]

[1] Graduate School of State University of Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padang, Sumatera Barat 25171, Indonesia, sandra.rhona@yahoo.com
[2] State University of Padang, Department of Guidance and Counseling, Faculty of Education, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padang, Sumatera Barat 25171, Indonesia, firman@fip.unp.ac.id
[3] State University of Padang, Department of Biology, Faculty of Mathematics and Natural Sciences, Jl. Prof. Dr. amka, Air Tawar Barat, Kota Padang, Sumatera Barat 25171, Indonesia, ar210371@fmipa.unp.ac.id
[4] State University of Padang, Department of Nonformal Education, Faculty of Education, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padang, Sumatera Barat 25171, Indonesia, handrianto@unp.ac.id

Annotation. This study aims to develop and validate a students' PBL and Team-Teaching approach in order to motivate nursing students to self-directed learning during clinical practice. The study employed mixed methods and a quasi-experimental design by involving participants from four nursing schools in Indonesia. The academic and clinical perspectives support each other in enhancing students' self-determination and clinical competence in fostering intrinsic motivation and professional growth.

Keywords: *self-determination, problem-based learning, clinical nursing education, team teaching.*

Introduction

Modernizing education requires an industry-responsive curriculum and innovative teaching and learning approaches. The newer instruction patterns, such as Problem-Based Learning (PBL), have successfully engaged students in critical thinking,

autonomy, and collaborative problem-solving skill sets (Wellhofer & Luhken, 2022; Hasan et al., 2024). Despite this, PBL has become universal across educational fields, but it has not received due notice in nursing, particularly in clinical training environments (Smith, 2024; Ding et al., 2021). This study intends to fill such gaps by integrating PBL into Team Teaching to supplement nursing students' self-determined learning between theory and practice. Although PBL is widely practiced, its effectiveness is inconsistent with clinical nursing due to the difficulty of applying theory to practice. Research conducted in this area has pointed out the inadequacies in self-directed learning and decision-making displayed by nursing students, which further tighten clinical adaptability and problem-solving difficulties in high-pressure environments.

From the perspective of SDT (Deci & Ryan, 1991), exposing students to programs where autonomy, competence, and relatedness are trained to motivate and learn ultimately makes the theory relevant to nursing education. Several research studies confirmed that self-determined learners have better problem-solving, persistence, and adaptability skills, which are quite eminent in professional nursing (Sanders & McHugh, 2021; Nyarko, 2021). Contrary to the traditional PBL format, only the instructor can run the entire model: this is the reliance on the mentor to justify a flexible learning environment greatly addressing the challenges in clinical instructional learning.

It is a well-transformed learning paradigm that allows the engagement of students wholly through activity and self-direction. Real-life dilemmas presented through classroom-specified problems facilitate students' interaction collaboratively in analyzing and synthesizing data to produce alternative solutions to those dilemmas (Wellhofer & Luhken, 2022; Daniel et al., 2024). The predominant problem-solving approach in PBL models within a nursing education framework has always been theoretically oriented and lacks sufficient scaffolding for actual clinic decision-making. Both of them are not replacing any of the students. Limited and inconsistent mentorship in the clinical setting also hampers students' ability to make effective use of the theoretical frameworks-academic inconsistencies between self-directed learning and the area of practice skills are often found through such a practice. Team Teaching, a collaborative teaching strategy incorporated in the PBL framework, adds value through diverse perspectives provided to students and comprehensive support from multiple educators while improving learning outcomes (Rogers, McCall, & Crowley, 2021). This notwithstanding, Coté (2024), Cummings et al. (2023), Searles (2021), and Yilmaz (2022) have not been able to sufficiently explore the extent to which integration of PBL and Team Teaching have enhanced self-determination among nursing students, particularly in clinical settings.

Nursing programs, however, have a special clinical education phase and possess unique challenges such as great stress levels, anxiety about doing something wrong, and difficulty in converting theory into practice (Hamilton, 2023). Generally, didactic approaches cannot address these challenges, leading to demotivation and disengagement from the students (Lahtaw, 2024; Milstead-Benabdallah, 2024). Real-world

problem-based learning and independent guided studies align with the need for industry-responsive and innovative education. Team Teaching can join synergies with this method to provide a structured yet flexible learning environment, encouraging self-determination and being environmentally sound for the preparation of nursing students in these demanding professional aspects (Ding et al., 2021; Attia, Sairany, & Treacy, 2021). PBL effectively boosts student engagement and outcomes, but its application in nursing education during clinical training remains inadequately addressed. The claimed gratifying synergy between PBL and Team Teaching to enhance self-determination has also not been given the necessary attention (Smith, 2024; Gilmore, 2024). Filling this void is of the utmost importance because it is well-known that nursing students struggle with self-directed learning and decision-making in an extremely stressful clinical environment (Chang, Hwang, & Gau, 2022; Kelley, 2024). On the other hand, notwithstanding that PBL promotes active learning, its success is further undermined in clinical settings by logistic inconsistencies that affect expert guidance; such variations consequently hinder consistency in student outcomes. Team Teaching can, however, only vary instruction in some specific settings and lacks the coordinated problem-solving associated with PBL, while the genuine beauty of combining these two techniques is that students can be given depth in theory but also have appropriate mentoring through the application while encountering clinical dilemmas.

The rationale for such research comes from the enduring concerns and issues already provided in nursing education: a narrative that needs some transformation, where students allow themselves a minute change from passive recipients of knowledge into assertive decision-makers in clinical practice. This study is aimed at developing and evaluating a PBL model integrated with Team Teaching elements to enhance self-determination among nursing students involved in clinical education, wherever the traditional setting where standalone PBL and Team Teaching work on their own has not been very successful in developing holistic abilities like self-determination, clinical competence, and stress management. When the study investigates the efficiency of this integrated alternative, it will also be configured to feed practical input to nursing educators and, therefore, will also contribute to the wider discourse about innovative educational practices within the field of healthcare (Denend et al., 2023; Kossybayeva et al., 2022).

In the present study, as for the research questions.

1. To what extent does the combination of Problem-Based Learning and Team Teaching affect the self-determination of nursing students in clinical training?
2. What is the validity, practicality, and effectiveness of the proposed PBL model in enhancing self-determination among nursing students?
3. How does applying the integrated PBL and Team-Teaching model address nursing students' challenges in clinical settings?

This research addresses a serious deficit in nursing education by introducing a new instructional framework within which PBL and Team Teaching coexist. The project has considered autonomy to be the key projected outcome, which complies with the current educational priorities and creates an immediate need for reform in clinical education. The anticipated outcomes will impact nursing education in fostering the development of self-directed, competent, and strong nursing professionals for the healthcare environment.

Literature Review

Problem-Based Learning in Nursing Education

Problem-based learning promotes solving problems and collaboration and is, hence, a well-suited substitute for the teaching style employed by traditional schools (Wellhofer & Luhken, 2022; Hasan et al., 2024). More than becoming a passive receiver of knowledge, the students were at the heart of this process through conventional PBL. Real and clinical scenarios are analyzed, hypotheses are drawn up, and solutions are proposed individually and in small groups.

The effectiveness of PBL in enhancing self-directed learning and problem-solving skills in students has been well documented (Smith, 2024; Ding et al., 2021). However, some areas make it difficult to transition theoretical problem-solving into the actual clinical world in nursing education; where stakes are high in clinical decision-making and complex patients, the cognitive and practical skills must transfer (Chang et al., 2022). PBL might highly depend on self-directed learning, with most of them being used to promote autonomy among students, but it could be an albatross if not properly scaffolded (Sanders & McHugh, 2021).

Challenges in PBL Implementation for Clinical Training

However, exceptions lead us to believe that PBL applied specifically to clinical training has its own set of management limitations, and one challenge often pointed out is that of an understructured mentorship in clinical settings that leads to varying learning experiences and credence to student skills, as per Lahtaw 2024 and Milstead-Benabdallah 2024. Due to inadequate guidance, nursing students cannot transfer theoretical knowledge to unpredictable and high-pressure situations. Once again, institutional barriers limit the implementation of PBL: little faculty flexibility, time limitations, and difficulty aligning PBL cases with clinical training objectives (Yilmaz, 2022).

The Role of Team Teaching in Nursing Education

Analyzing some of these problems includes the adoption of TT into medical and nursing education, which should integrate that particular interdisciplinary knowledge into the education process (Rogers et al., 2021). Defined as an instructional method in which more than one educator collaborates in the presentation of learning activities, TT enhances instructional diversity, provides immediate feedback, and contributes to a richer learning interaction (Cummings et al., 2023). TT, therefore, provides an excellent advantage for clinical training, especially where academic qualifications take up just a small part of learning, and the remainder is practiced as an elitist (Coté, 2024).

It has been shown that nursing students who have learned from academic faculty and clinical instructors integrate knowledge and skills better, are more engaged, and ultimately feel more confident in clinical decision-making (Hamilton, 2023). However, TT does not serve as an organizational tool for active learning in problem-solving, as it concerns content delivery and does not assist students through more complex problems.

Integrating PBL and Team Teaching: A Novel Pedagogical Model

Considering everything, what we mentioned above makes PBL and Team Teaching a very exciting pedagogical innovation in nursing education. The integrated model, which is theoretically based on Deci and Ryan's (1991) Self-Determination Theory (SDT), intended to develop nursing students in terms of autonomy, competence, and relatedness-three important components of self-determination that are even more required in professional development and intrinsic motivation.

PBL affords autonomy by providing students with opportunities for investigation and self-directed learning, but a perceived level of competence is achieved through a structured approach to mentorship offered by two instructors. Relatedness reflects the role of social interactions in learning and is facilitated through collaborative problem-solving and the supportive learning environment created by Team Teaching. The interaction of two approaches, Academic and Clinical, is what this outcome of such incorporation shows. It creates a structured yet flexible system to overcome the disadvantages of both PBL and TT when each is used in isolation.

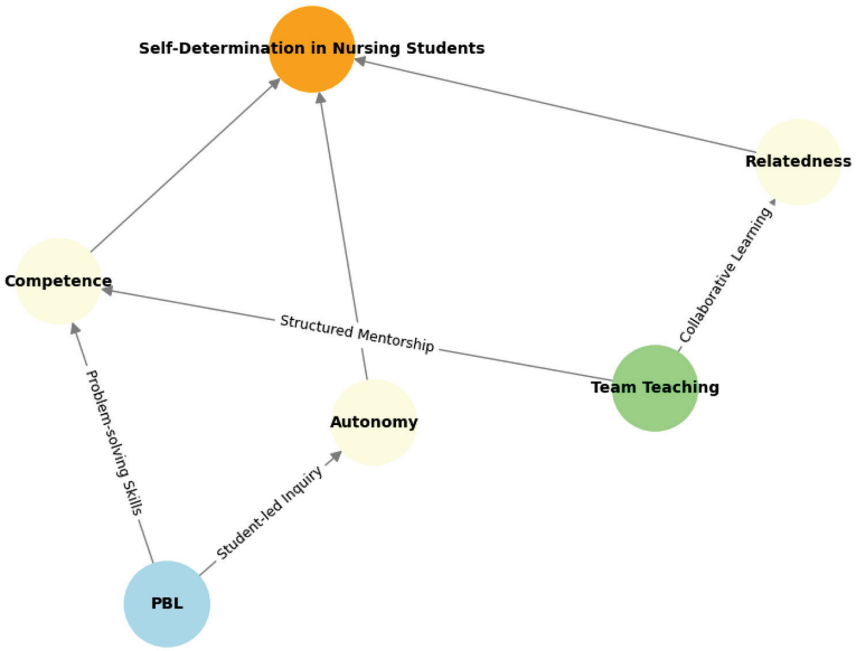
Empirical Gaps and Research Justification

An evidence-based perspective is supported for integrated pedagogical models being touted as research areas in nursing education. Evidence emerged from studies that were able to enhance nursing students' clinical performance, foster self-confidence, and facilitate knowledge retention (Denend et al., 2023; Kossybayeva et al., 2022). However, a gap still exists with respect to clearly understanding the effects that different models have on the self-determination of the student during clinical practice training. This study will try to move knowledge on how pedagogical innovations can assist nursing

students in their professional development by exploring the impact of this model on students' autonomy, competence, and relatedness in a systematic way.

Figure 1

Conceptual Framework of PBL and Team-Teaching Integration



This merged framework diagram, PBL, and TT emphasize a self-determined regulation among nursing students by allowing for the empowerment of the three basic constructs of autonomy, competence, and relatedness defined in the Self-Determination Theory (SDT) (Deci & Ryan, 1991). PBL fosters autonomy by promoting self-directed learning, independent inquiry, and decision-making in clinical problem-solving. It enhanced further competence, providing structured opportunities for students to solve problems while applying theoretical knowledge to real-life scenarios. This mentorship approach enhances faculty and clinical instructors' competencies by fostering a seamless, scaffolded learning environment. Team Teaching promotes relatedness through peer and co-teacher collaboration. Ultimately, this integrated model boosts nursing students' self-determination, equipping them with confidence, motivation, and readiness for complex clinical settings and their profession. In the final analysis, the intimate learning experience is established by the interactional duality of the academic domain and its respective clinical practices, each reinforcing the other.

Methods

Research Design

This study took place over 16 months in which quasi-experimental methods were used to compare PBL-Team Teaching with other traditional methods of teaching training. It employed mixed methodology in framing the analyses. This study was carried out from September 2023 to December 2024. According to Creswell and Clark (2018), the findings that emerge from the quantitative phase will shape and guide the qualitative inquiry to better understand intervention effects by design in the subsequent sequentiality. The actual effects of PBL will be evaluated through a quasi-experimental design.

Quasi-Experimental Procedures

Figure 2

Quasi-Experimental Procedures

Using a quasi-experimental study design, the investigation took a systematic approach through three phases to fully assess the effect of the integration of Problem-Based Learning (PBL) and Team Teaching on nursing students concerning self-determination, clinical competence, and problem-solving abilities. The baseline assessment was the beginning and took place during the first two months of the study. The participants completed pre-test assessments for this duration to evaluate their initial self-determination, clinical competence, and problem-solving skills. At the same time, instructors undertook standardized training on PBL facilitation and Team-Teaching methodologies to bring consistency into implementing the intervention.

The intervention phase commenced after baseline assessment and lasted for twelve months. During this period, participants in the intervention group engaged in structured weekly PBL sessions facilitated by a dual-instructor team-native academic faculty and clinical educators. The topics were analyzed and solved by students under conditions of balance and supervision, and in addition to weekly PBL sessions, students took bi-weekly clinical practice hours to bring in theory aspects within different healthcare yard contexts. To consolidate learning, this included structured reflection

sessions conducted on a monthly scale in which students were supposed to establish their experiences critically, become more metacognitively aware, and firm up their understanding of clinical decision-making.

The intervention-outcome assessment phase of the study occurred only in the last two months of data collection. Participants completed post-test evaluations identical to those administered during the baseline assessment to allow comparison of pre- and post-intervention outcomes. Qualitative data collection methods were employed to complement the quantitative findings: focus group discussions and semi-structured interviews. Qualitative insights into students' experiences, the perceived efficacy of the intervention, and the particular routes by which the integrated PBL and Team-Teaching model affected their self-determination and clinical competence formed an altogether well-founded framework for an exhaustive assessment of the impact.

Participants

The sample size was determined with G*Power 3.1 software specifying medium effect size d = 0.5, alpha = 0.05, and a desired power of 0.80, giving a minimum sample size requirement of 128 participants with equal division into the two groups of intervention and control samples. To accommodate the dropout, this target sample size was inflated by twenty percent to give a final sample size of 160 nursing students recruited from four nursing schools in Indonesia. When the sample size was increased, it was proved to add statistical credibility, even enhancing representation within the diverse geographical and demographic contexts.

Student recruitment activities were carried out non-randomly in four institutions accredited for nursing training. Eligible participants had to take medical-surgical nursing and complete all theoretical prerequisite coursework without clinical training experience. Other important criteria would be proficiency in Indonesian and English and commitment to study during the study period. The exclusion criteria considered experience with PBL or Team Teaching in prior studies or other clinical training programs and, generally, the reinvestment of time in the whole intervention schedule during the study. This equalizes this sample baseline for the measurement of subsequent interventional effects. Table 1 presents a summary of the demographic characteristics of the participants.

Table 1

Demographic Characteristics of Participants

Demographic Variable	Students (n=160)	Instructors (n=10)	Faculty (n=5)
Gender	128 Female, 32 Male	16 Female, 4 Male	8 Female, 2 Male
Age Range	20–25 years	30–45 years	35–50 years
Academic Performance (GPA)	3.0-4.0	N/A	N/A
Years of Teaching/Practice	N/A	5-15 years	10-20 years

The involvement of nursing students, clinical instructors, and faculty is 160, 20, and 10, respectively, from the four accredited nursing schools, with a selection bias calibrated on relevant expertise. This thus implies that purposive sampling was used to involve twenty clinical instructors and ten academic faculty members based on their expertise and experience. Selected instructors had at least five years of clinical or teaching experience and held master's degrees in nursing or related fields. Prior clinical supervisory experience was necessary, and all of the instructors had completed a standard training program in PBL facilitation prior to the start of the intervention. This comprehensive training ensured uniformity in the intervention and adherence to the study protocol.

Development of the PBL Model

The development of the PBL model has passed through three main stages: assessment, model design, and validation. The needs assessment phase comprised interviews and focus group discussions (FGDs) with students, instructors, and faculty regarding barriers in clinical training and the convergence of PBL with Team Teaching. The insights gained from this phase led to the model's design, including its major areas of concern, such as the contextualization of problems, collaborative facilitation, and reflection practices.

Implementation Procedures

The intervention group participated in forty-eight weekly four-hour PBL sessions during the study period. This practice was complemented by ninety-six hours of bi-weekly clinical practice and monthly reflection sessions, while continuous feedback was given to the students by both academic and clinical instructors during the intervention period. The contrast group, on the other hand, followed a standard clinical education curriculum that consisted of standard hospital rotations plus the supervision of clinical instructors. The clear distinction between the two groups facilitated an unbiased evaluation of the effect of the intervention. Students were clustered into five teams, with their tutors comprising one clinical instructor and one academic faculty member. Weekly sessions revolved around real clinical cases in which theoretic knowledge was to be applied by the students as they collaboratively provided a solution while reflecting on their learning. Therefore, the instructors and faculty facilitated discussion, provided feedback, and guided the students in integrating clinical and academic perspectives (Denend et al., 2023; Sanders & McHugh, 2021).

Instruments

Data collection included various validated instruments and specially designed tools for this study. The Self-Determination Scale (SDS; Deci & Ryan, 1991) was used to measure self-determination in terms of autonomy, competence, and relatedness. The

validity and practicality of the PBL model were assessed using a rubric drawn from well-established instructional design frameworks by the researcher (Smith, 2024). The participants' experiences were qualitatively explored with the help of metaphorical instruments of exploration like FGDs and semi-structured interviews with the help of numerous probes posed to them.

Data Collection

Quantitative data collection employed many validated instruments. The Self-Determination Scale was validated in Indonesia with high reliability ($\alpha = 0.89$) for measuring autonomy, sense of competence, and relatedness. The Clinical Competence Assessment Tool includes fifty standardized items with good inter-rater reliability (ICC = 0.85), whereby evaluators, blind to group assignment, administered the assessments monthly. The Problem-Solving Inventory was adapted to the nursing context, validated in Indonesian ($\alpha = 0.87$), and administered quarterly to indicate the change in problem-solving ability. Qualitative data collection incorporated individual interviews with forty participants and focus group discussions with eight groups of six to eight participants. All sessions were audio-recorded and later transcribed word-by-word. Based on structured observation protocols for intervening, supplementing instruction sessions with video recordings and extensive field notes were made by trained observers. During the investigation, participants kept reflective journals, with students making weekly entries and instructors providing monthly entries based on guided, structured prompts.

Data Analysis

Incorporating methods of analysis for quantitative and qualitative variables: Quantitative analysis began with thorough data cleaning and normality testing followed by multiple imputations to fill in missing data. Then, mixed-effects ANOVA gave the results for repeated measures, with the nested structure of the data accounted for. They computed effect sizes to know how big the changes had been appearing. Qualitative data were analyzed thematically following the constant comparative method, with two researchers independently coding with NVivo version 14, according to Braun and Clarke (2006). Thematically inductive, it was to capture the participant's perception of the current model's influence and improvement points. Integrating quantitative and qualitative findings employed joint displays and integration matrices to develop comprehensive meta-inferences.

The hypotheses that can be drawn from the aforementioned theoretical framework, which is in line with the driver's perspective on self-determination theory (Deci & Ryan, 1991) and the existing literature regarding PBL and Team Teaching are:

H1: Compared to traditional clinical training, the integrated PBL and Team Teaching model will significantly enhance nursing students' self-determination (autonomy, competence, and relatedness).

H2: Students in the intervention group will demonstrate higher clinical competence and problem-solving abilities than those in the control group.

H3: The structured reflection sessions within the intervention will contribute to greater metacognitive awareness and professional identity formation among students.

H4: Students who receive dual-instructor facilitation will report greater confidence in navigating clinical environments than those undergoing conventional training.

Ethical Considerations

The ethical principles of the Indonesian Nursing Education Ethics Committee and the institutional review boards of the respective nursing schools involved have approved the following study: informed consent was received from all participants regarding what the study intends to accomplish, what procedures were involved, any risks involved, and the right to draw out at any time. Data confidentiality and protection were strictly maintained using anonymized personal data and secure storage of participant records, while only aggregate findings were reported to be available to authorized researchers. Minimal-shady assessment and occasional psychological support have been given to students who generally experience anxiety toward assessment activities' being artificially' included. The inclusion criteria, in this case, were generally meant to ensure an ethical and fair selection, thus warding the way of a hindrance to selection bias and offering an equal opportunity to each eligible student. Finally, the ethics of reporting and dissemination were prioritized with active accountability and transparency in sharing findings across participating institutions for greater learning in nursing education.

Results

Impact of PBL and Team-Teaching Integration on Self-Determination

The first research question investigated the blended learning activity of Problem-Based Learning and Team teaching and its effects on nursing students' self-determination during clinical practice. The mixed-method analysis showed that the students significantly improved self-determination, with distinct emerging patterns in different dimensions and at various time points. Longitudinal analysis of scores from the Self-Determination Scale showed significant differences between the experimental and control groups throughout the study period. Improvement across all three dimensions of self-determination was progressive in the experimental group. Initially, no significant differences were found between groups in the baseline scores ($p > .05$), meaning they had a comparable beginning level. However, the experimental group had increased across all dimensions by the midpoint assessment (8 months) when it

made significant progress. The self-determination scores based on three dimensions are shown in Table 2 below.

Table 2

Self-Determination Scale Scores Across Dimensions

Dimension	Baseline (M ± SD)	Midpoint (M ± SD)	Final (M ± SD)	Control (Final M ± SD)	Interaction Effect (F, p, η^2)
Autonomy	3.25 ± 0.52	3.85 ± 0.48	4.12 ± 0.47	3.42 ± 0.51	$F(2,316) = 24.63$, $p < .001$, $\eta^2 = 0.14$
Competence	3.18 ± 0.59	3.76 ± 0.53	4.05 ± 0.51	3.38 ± 0.54	$F(2,316) = 21.89$, $p < .001$, $\eta^2 = 0.12$
Relatedness	3.31 ± 0.56	3.92 ± 0.51	4.20 ± 0.49	3.45 ± 0.53	$F(2,316) = 27.15$, $p < .001$, $\eta^2 = 0.15$

Note: M = Mean, SD = Standard Deviation.

Based on Table 1, analysis of autonomy scores revealed a significant group-by-time interaction effect ($F(2,316) = 24.63$, $p < .001$, $\eta2 = 0.14$). Whereas the intervention group's mean autonomy scores increased from baseline (M = 3.25, SD = 0.52) to the midpoint (M = 3.85, SD = 0.48) and the final assessment (M = 4.12, SD = 0.47), the control group only showed very little change from baseline (M = 3.28, SD = 0.54) to the final assessment (M = 3.42, SD = 0.51). Competence scores similarly demonstrated significant interaction effects ($F(2,316) = 21.89$, $p < .001$, $\eta2 = 0.12$). The intervention group's competence scores progressed from baseline (M = 3.18, SD = 0.59) to midpoint (M = 3.76, SD = 0.53) and final assessment (M = 4.05, SD = 0.51). The control group's changes were notably minor, moving from baseline (M = 3.20, SD = 0.57) to final assessment (M = 3.38, SD = 0.54).

The interaction effect was powerful for relatedness scores: $F(2,316) = 27.15$, $p < .001$, $\eta2 = 0.15$. The intervention group had significant increases in relatedness scores from baseline (M = 3.31, SD = 0.56) to midpoint (M = 3.92, SD = 0.51) and end (M = 4.20, SD = 0.49) assessments, while the control group displayed little change between baseline (M = 3.29, SD = 0.55) and final assessment (M = 3.45, SD = 0.53). Mixed-effects modeling, accounting for nested data structures within the four nursing schools, confirmed these findings while controlling potential side effects. Model analysis confirmed that there was still significant impact of an intervention after accounting for difference in institutions: $\beta = 0.68$, SE = 0.12, $p < .001$.

Concurrently, from the interview data and reflective journal accounts, the thematic analysis revealed some of the critical mechanisms that improved self-determination through the integrated approach. The first key theme was Progressive Autonomy Development, characterized by increasing confidence among the students to make clinical judgments. In the words of one of the participants, "Solution-focused sessions

helped me put on a systematic hat when addressing clinical situations. I learnt to be increasingly confident to take my own decisions, knowing there was a solid framework to support me."

The next similar theme is "Competence by Integration"- how the joining of academic and clinical perspectives has claimed to enhance students' self-worth as valid to their competence. One participant responded, "Having instructors and faculty walk through these complex cases helped me understand how theoretical knowledge converts into practical skills. It's not just knowing what to do; it's about why to do it."

The next recurrent theme was collaborative growth about their interconnections. According to most of the students, the team-based approaches usually do build a huge collaborative learning environment. One of the students stated: "The group discussions and shared problem-solving made me feel part of a learning community. We were not individuals anymore but becoming professional colleagues." The analyses of reflection journals show that people's self-images change gradually over time for each student. In the beginning, the end reflections contained mostly uncertainty and reliance on what instructors thought; later reflections became increasingly characterized by confidence and independence in judgment.

Validity, Practicality, and Effectiveness of the PBL Model

Model validity

Cross-verification related to the integrated PBL and Team Teaching-based learning process model produced convincing evidence of the content and construct validity of the model. The data in Table 3 provides validation results.

Table 3
Validation Metrics for the Integrated PBL and Team-Teaching Model

Validation Metric	Result
Content Validity Indices (CVI) for Components	0.82 to 0.94
Overall Scale CVI	0.89 (Threshold: 0.80)
Expert Agreement on Integration of Perspectives	92% Agreement
Factor Structure Explained Variance	76.3% of Total Variance
Factor Loadings Range	0.68 to 0.89

Three rounds of Delphi deliberation showed a widespread consensus of expert panel reviews across entire Delphi rounds on the theoretical model basis and the network of its structural model components. From 0.82 to 0.94 were the possible content validity indices (CVI) for a range of individual components, with a CVI overall scale of 0.89, clearly above the threshold requirement of 0.80. Experts collectively endorsed the

intra-correlation of clinical and academic pontificators to represent an understatement, thus amounting to an overall agreement of 92% on having a complementarity proponent intended to represent constructions. Construct validity was also performed through implementation result factor analysis, which had a clear five-factor structure in consonance with the theoretical framework on which the model was built. These areas included problem-solving capability, clinical reasoning, collaborative learning, identity formation, and self-directed learning, constituting 76.3% variance from the total implementation outcome. Good construct coherence was evidenced by the factor loadings falling in the range of 0.68–0.89.

Practicality assessment

Table 4
Summary of Implementation Data and Practicality Analysis

Dimension	Details
Resource Utilization	Implemented within existing institutional frameworks; no significant additional resources required.
Time Allocation	Instructors spent an average of **5.2 hours/week** (SD = 0.8), within the feasibility threshold of **6 hours/week**.
Instructor Feedback	**Mean practicality rating**: **4.35/5** (SD = 0.46). - **Integration into workflows**: **4.42/5** (SD = 0.38). - **Alignment with teaching objectives**: **4.48/5** (SD = 0.41).
Implementation Fidelity	**92% of planned sessions** are conducted as scheduled.

Data from Table 4 relating to implementation show a high practicality rating across many dimensions. The resource analysis posited that only minor extra resources were required for model implementation through existing institutional structures. Concerning the time allocation, instructors reportedly spent an average of 5.2 hours per week (SD = 0.8) on activities associated with the intervention, which was just under the imposed feasibility threshold of 6 hours per week. Instructor feedback from structured evaluations noted very high levels of satisfaction with the implementation process. Integration into preexisting workflows (M = 4.42, SD = 0.38) and alignment with clinical teaching objectives (M = 4.48, SD = 0.41) received particularly high scores, while the overall mean practicality rating on the 5-point scale was 4.35 (SD = 0.46). The administrative data provided indicated that 92% of the planned meetings were rated successful and completed, establishing very high levels of fidelity of implementation. Qualitative analyses of the interviews of instructors provided insights into both the practical strengths and shortcomings of the model. The flexibility across clinical

contexts was one of the most salient factors noted. Observed by a clinical instructor: "The clear framework allowed adaptation to specific ward situations and patient cases." The academic faculty members agreed with the structured integration points; one commented: "The model created natural opportunities for connecting the theoretical with the clinical observation, which made it easier to align the curriculum."

Effectiveness evaluation

Table 5

Effectiveness of the PBL Model: Summary of Outcome Measures

Outcome Measure	Intervention Group	Control Group	Statistical Results
Clinical Performance	Baseline: M = 3.45 (SD = 0.50)	Baseline: M = 3.48 (SD = 0.49)	$F(1,158) = 23.67$, $p < .001$, $\eta^2 = 0.13$
	Final: M = 4.20 (SD = 0.42)	Final: M = 3.75 (SD = 0.45)	
Problem-Solving Capabilities	Baseline: M = 3.28 (SD = 0.54)	Baseline: Not reported	$F(1,158) = 19.83$, $p < .001$, $\eta^2 = 0.11$
	Final: M = 4.15 (SD = 0.48)	Final: Not reported	
Course Satisfaction	M = 4.42 (SD = 0.38)	M = 3.85 (SD = 0.45)	Significantly higher for the intervention group

Through various outcome measures, the effectiveness of the PBL model was evaluated. Clinical performance assessments indicated significant improvements in the intervention group compared to the controls. The intervention group's mean clinical performance scores increased from baseline (M = 3.45, SD = 0.50) to final assessment (M = 4.20, SD = 0.42), representing a more significant gain than the control group (baseline M = 3.48, SD = 0.49; final M = 3.75, SD = 0.45; $F(1,158) = 23.67$, $p < .001$, $\eta2 = 0.13$). The problem-solving abilities of students, evaluated via standardized clinical situations, were found to change appreciably. The intervention group took a strong lead through complex clinical decision-making tasks, with their composite scores showing improvement from 3.28 (SD = 0.54) to 4.15 (SD = 0.48). The improvement made by this intervention group was significantly greater than that of the control group ($F(1,158) = 19.83$, $p < .001$, $\eta2 = 0.11$). Effectiveness was further substantiated by student feedback. The course satisfaction surveys indicated that the intervention group scored significantly higher (M = 4.42, SD = 0.38) than traditional clinical training (M = 3.85, SD = 0.45). Thematic analysis of student reflective journals uncovered three key areas where effectiveness was perceived as enhancing clinical confidence, theoretical integration, and professional identity.

Integration of implementation metrics

Table 6

Impact of Implementation Quality on Student Outcomes: Key Metrics and Mediating Effects

Metric	Key Findings
Fidelity and Student Performance	High fidelity scores (>4.0/5) were associated with more significant student performance improvements ($r = 0.67$, $p < .001$).
Time Series Analysis	Mean fidelity scores improved from **3.85 (SD = 0.42)** in the first month to **4.32 (SD = 0.35)** in the final month.
Mediating Role of Implementation Quality	Implementation quality mediated the relationship between the intervention and outcomes.
Path Analysis Results	- Indirect effect on clinical performance: **$\beta = 0.34$ (SE = 0.08, $p < .001$)**. - Indirect effect on self-determination scores: **$\beta = 0.29$ (SE = 0.07, $p < .001$)**.

Measurements of quality in implementation yielded analyses showing strong interaction effects of fidelity measures on outcomes. High fidelity (>4.0) sessions may improve student performance: r = 067; p < .001. The time series indicated that implementation quality improved during the study period, with mean fidelity scores increasing from 3.85 (SD =.42) in the first month to 4.32 (SD = .35) in the last month. Implementation quality was found to mediate the relationship between intervention and student outcomes, as revealed by a multivariate regression. Path analysis revealed significant indirect effects of implementation fidelity on clinical performance with coefficients $\beta = 0.34$, SE = 0.08, $p < .001$, self-determination scores with coefficients $\beta = 0.29$, SE = 0.07, $p < .001$. Thus, the necessity of maintaining strong implementation standards was stressed.

Sustainability assessment

Indicators of sustainability in the long run were good, with 85% of the participating faculty indicating they would use the model post-study. The cost-benefit analysis yielded favorable ratios, with instructor training time being the primary investment. Notions of resource utilization suggest that the implementation costs have declined since instructors have become more proficient in intervention delivery. Such continuous support can be seen through the administrative records data throughout the implementation; this indicates that the institution's commitment is towards allocating necessary financial resources and scheduling accommodations. Through qualitative feedback from department heads and clinical coordinators, there is organizationally strong support

for the program, specifically stating improvements in students' performance as reported by clinical partners. Their methods complemented the data obtained gives the impression of reliable evidence. Therefore, the successful uptake and sustainability of the PBL model in nursing education are greatly supported by a thorough evaluation for validity, practicability, and effectiveness.

Addressing Challenges in Clinical Settings through the Integrated PBL and Team-Teaching Model

The integrated Problem-Based Learning (PBL) and Team-Teaching model was primarily investigated to examine how it would counter the students' barriers to clinical settings. Quantitative and qualitative data revealed that the intervention mitigated many key challenges and encouraged better adaptability, confidence, and competence in the student's clinical training. Table 7 below shows the effectiveness of integrating PBL and team teaching in addressing the students' challenges.

Table 7

Effectiveness of Integrated PBL and Team Teaching in Addressing Nursing Students' Challenges

Outcome Measure	Intervention Group	Control Group	Statistical Results
Clinical Competence	Baseline: M = 3.45 (SD = 0.50)	Baseline: M = 3.48 (SD = 0.49)	$F(1,158) = 23.67$, $p < .001$, $\eta^2 = 0.13$
	Final: M = 4.20 (SD = 0.42)	Final: M = 3.75 (SD = 0.45)	
Stress Management	Baseline: M = 4.15 (SD = 0.48)	Baseline: M = 4.10 (SD = 0.49)	$F(1,158) = 19.56$, $p < .001$, $\eta^2 = 0.11$
	Final: M = 2.99 (SD = 0.45) (28% reduction)	Final: M = 3.78 (SD = 0.52) (8% reduction)	

Based on Table 7, the integration of PBL and Team Teaching was associated with significant improvements in clinical competence and stress management among nursing students. Clinical performance scores for the intervention group increased markedly from baseline (M = 3.45, SD = 0.50) to final assessment (M = 4.20, SD = 0.42), compared to the control group, which exhibited smaller gains (baseline M = 3.48, SD = 0.49; final M = 3.75, SD = 0.45; $F(1,158) = 23.67$, $p < .001$, $\eta2 = 0.13$). Furthermore, a marked reduction in reported stress levels was observed. Using a validated stress assessment tool, the intervention group's mean stress scores decreased by 28% from baseline (M = 4.15, SD = 0.48) to the final assessment (M = 2.99, SD = 0.45), whereas the control group showed only a modest reduction of 8% (baseline M = 4.10, SD = 0.49; final M = 3.78, SD = 0.52; $F(1,158) = 19.56$, $p < .001$, $\eta2 = 0.11$).

It is notable that qualitative data offered deeper insights into how the integrated model resolved some of its most significant challenges. A key theme was developed as students learnt to have confidence in clinical decision making. Students reported increased confidence in working through complex problems during structured sessions. As said by one interviewee, "I used to doubt my ability to make decisions under stress, but dual mentorship helped me develop critical thinking and judgment." This was, in particular, evident in the way confidence was built up during extremely stressful situations like patient emergencies and sudden complications.

Reduction of anxiety as a result of collaborative learning, which is one of the basic advantages of intervention. Team teaching effectively created an atmosphere conducive to cooperation and free from anxiety normally experienced by students in clinical environments. One student noted, "I felt less overwhelmed knowing our clinical and academic instructors supported us as a team, not to judge us."

This team approach provided peer support, reducing loneliness and stress, while effectively bridging theory and practice. Participants indicated that the coexistence of distinct academic and clinical perspectives allowed them to contextualize theoretical knowledge better in the actual world. One of the students explained that linking theoretical knowledge from classes to being used in real-life practice had always been a hard nut to crack during traditional rotations. On the contrary, it was PBL sessions that allowed discussions and reflections on how theories apply in clinical settings, and hence, that seamless transition was much better nurtured. This better integration of theory was evident from the reflective journals where students pondered applying their theories to practical issues in clinical decision-making.

The intervention, accordingly, targeted several challenges found only in clinical training. Traditionally regarded as something almost all students fear, the fear of making mistakes was substantially lowered in this intervention by accepting a learning environment that fostered mutual support and encouragement stimulated by the dual-instructor model. One clinical instructor illustrated how framing mistakes as learning opportunities during PBL discussions made it easier for students to ask questions and engage with critical thinking. Another barrier was difficulty with self-directed learning. Many students experienced considerable difficulty with this during early periods of clinical training. Notably, the PBL setup offered enough external structure to not only help students in their initiation into self-directed learning but also support more student initiative. Instructors were gradually becoming less relied upon as reflective journals indicated proactive problem-solving.

The stress management intervention in a high-pressure situation was successfully conducted by including stress reduction components into PMPBL. This way, students felt more comfortable dealing with emotional distress and through the participants' comments on the reflection seminars, "helped us manage stress by reflecting on our experiences." Subgroup analyses revealed that the greatest gains in clinical competence

(mean = 1.25, SD = 0.34) and stress management (mean decrease =1.36, SD = 0.29) were among members of students who at preintervention showed the lowest performance and confidence levels, thus demonstrating equality in education by the model. PBL and co-teaching emphasized the realities of collaborative problem-solving and challenges nursing faces in everyday life, which further boosted the self-assuredness in decision making whilst mitigating anxieties, creating links between theories and the application thereof. Here are the key aspects: autonomy, competence-through-integration, collegial growth, anxiety reduction, theory-practice connection, and metacognitive awareness, acquired from thematic analysis in terms of confidence, decision-making, and learning experience.

Table 8

Summary of Key Themes, Sample Quotes, and Interpretations

Theme	Sample Quote	Interpretation
Progressive Autonomy Development	*"At first, I always waited for my instructor's approval before making decisions, but over time, I felt more confident in assessing patient conditions on my own."*	The structured support provided through PBL and TT helped students transition from dependence on instructors to independent decision-making.
Competence Through Integration	*"It gave to me understanding of practical outcomes from academic situation; because faculty members in the technique were professional and good, and the quality of instructor was demonstrated to be quite knowledgeable."*	Both theoretical and practical applications and applied experience were instrumental in strengthening students' clinical reasoning and problem-solving capacities.
Collaborative Growth and Peer Support	*"Indeed, working on case studies with my co-learners and instructors has really opened new vistas for me, which I think raises my self-confidence in clinical discussions."*	A conducive and supportive team environment of learning will help reduce the overpressure of formal corporate culture in social communication.
Reduction in Anxiety and Stress	*"Earlier, I was fond of worrying about making clinical mistakes much. With the structured PBL sessions, I have acquired fresh ways of analyzing situations and, therefore, am far more relaxed."*	Along with such tutorial sessions offered in an organized learning context, evidence follows of diminished fear failure for confidence building in clinical decision-making within real-world contexts.

Theme	Sample Quote	Interpretation
Bridging Theory and Practice	*"Such patient-centered care is what was taught us in class, but how to apply that patient orientation in the clinical setting has proven to be a real challenge. Somehow the discussions have bridged that for me-theory with real-life cases."*	The two-teacher method will truly appeal to students, thus enabling them to relate practical experience to their present time classroom learning.
Metacognitive Awareness and Reflection	*"Documentation of weekly interpretation was helpful, thus, allowing me to hone my decision-making skills and zero in on areas that needed my attention."*	Based on reflection-based learning, self-assessment capabilities among students were strongly fostered and encouraged toward career enhancing pursuits.

From here, the findings indicate a construction of clinical competence by pairing both PBL and Team Teaching. Some features foster self-directed learning and professional identity in the students themselves. Structured mentorship and academic and clinical instructors acted as a bridge toward this transition, with students becoming more active actors and decision-makers in their learning process.

Discussion

The hypotheses in the study find some support since the two variables integrated with PBL and Team Teaching substantially enhance students' self-determination, clinical competence, and problem-solving abilities. Each hypothesis is considered against the backdrop of the quasi-experimental study's quantitative and qualitative data.

Phase 1: Baseline Assessment and Initial Student Challenges

Accordingly, at baseline there was practically no difference in self-determination scores for the two student groups. Hence, self-determination autonomy, relationship, and competence were at the commencement similar levels between the groups. Qualitative findings raised critical issues impeding learners from making self-directed study, from applying theoretical knowledge to real clinical settings, and their confidence in decision-making. These findings were probably in line with earlier studies, including Chang et al. (2022) research, that referred to the myriad transition challenges associated with the profession of nursing as brought by academic learning in clinical practice.

The empirical study demonstrated the success of applying Team Teaching, as defined by Rogers, McCall, and Crowley (2021), with the organized approach of Problem-Based Learning (PBL), according to Wellhofer and Luhken (2022) and Sunarti et al. (2024).

Thus, a dynamic and collaborative environment where students learn multiple dimensions of professional growth at the same time was created. By the first hypothesis (H1), however, students in the experimental group showed great improvements in perceived autonomy, competence, and relatedness, in line with the principles of Self-Determination Theory (Deci & Ryan, 1991). The scaffolding provided by the dual-instructor model to students for independent clinical decision-making enhanced their technical proficiencies while preparing them for harsh realities in the profession.

Phase 2: Intervention Implementation and Progressive Changes

Peer learning and mentoring come as a result of the structured mentorship and collaborative learning opportunities provided by the PBL and Team-Teaching intervention. The very systematic development was through a two-teacher system through which the students would learn to be independent in making clinical decisions. This numerical data indicated that an increase in independence and competence scores at the mid-intervention of four months was statistically significant. Such changes in the scores were matched by students' reflective journal entries, where they claimed to feel independent in conducting clinical activities. Such findings, in summary support the self-determination theory of Deci and Ryan (1991), which propagates that environments which are supportive of autonomy will benefit motivation and learning through self-direction. It adds to the findings of Scott (2021) pertaining to differentiated instruction within that particular context of nursing education; such gains in students' performances add to the work by Nyarko (2021), who emphasized the need for teamwork skills in professional education and establish a robust base for their development. Thus, structured team processes become a major conduit through which theory and practice meet in preparing competencies in the clinical domain.

The results of this study confirmed the second hypothesis, as participants exposed to the intervention showed higher levels of clinical competence and problem-solving abilities than those from the traditional control group. To what extent can mentorship prove its effectiveness regarding theoretical problem-solving and practical application? The practical difficulties were the same as the ones presented in this research work involving schedule coordination and work management; also, several issues were highlighted by Lahtaw (2024). Our findings indicate that they contribute to developing competencies valued in professional contexts; thus, they support Kelley (2024), who views active learning as necessary in professional education. Combining clinical and academic perspectives in the model addresses the space Milstead-Benabdallah (2024) found regarding the gap between theoretical and practically applied education. As supposed in H3, reflective sessions would be instrumental in creating students' metacognitive awareness and professional identity. Students applied the use of qualitative data for structured reflection as a way to keep learning and develop clinical judgment.

Phase 3: Post-Intervention Outcomes and Long-Term Impact

With the intervention and control groups, it was seen how differently results came from the end of the inquiry. The self-determination and, more importantly, the relatedness scores were better heats that collaborative learning aided students in eventually shaping their professional identities. The intervention may have affected most of the students with low confidence in the clinical environment, as it confirmed its efficacy with learning-impaired students. Reflection sessions should foster metacognitive awareness and promotion of self-regulated learning. Focus groups post-intervention indicated that students in their cohort could adapt more quickly to clinical necessities and performed much better in teams when pressed. These reflections endorse the contribution of the dual mentorship model toward resilience (Jusoh et al., 2023; Kelley, 2024; Waty et al., 2024). Sanders and McHugh (2021) also added value by indicating the import of self-determination in facilitating problem-solving and adaptability, generalizing the results further. Research on stress in clinical education shows that significant reduction of stress has an effect beyond that of dual academic and clinical mentoring, revealing and clarifying the real-life emotional burdens faced in clinical practice. This dual-leading feature of an integrated model allowed students to feel supported during times of high emotional stress, consistent with Chang, Hwang, and Gau's (2022) description of structured guidance to enhance self-efficacy.

The validation of the dual-teaching model is further strengthened by feedback from students taught by dual-instructor facilitation. Students stated that their confidence in managing complex clinical situations improved. The implication of this outcome is providing structured learning sessions enriched by both academic and clinical perspectives to the value of a dual-teacher model and to the ultimate advantage of the student. The qualitative data has provided in-depth contextual information on how the integrated model dealt specifically with unique challenges. Increased confidence in clinical decision-making was found to be an overarching theme: the journey to connect theory with practice in structured problem-solving sessions. Moreover, the findings validate the effectiveness of the model posited by Ding et al. (2021) within a flipped classroom and team-based learning residency training context. The problem-solving process inherently describes contextual learning, according to Wellhofer and Luhken (2022), which relates learner motivation and real-life applications within the laboratory setting. Alternatively, incorporating clinical and academic perspectives through co-teaching can be an innovative approach. The model created a unique learning environment that does not distinguish between classroom and clinical training, as it merges theoretical knowledge and practical skill-building in a collaborative setting. The dual-resonance effect, as conceptualized for this study, addresses the juxtaposition between academic and clinical education (Kelley, 2024; Smith, 2024).

The study further emphasized the role of collaborative learning in reducing anxiety and creating strong bonds of friendship. The students maintained that this method

formed an engaging learning community, which diminished the sense of loneliness. This is consistent with Nyarko's (2021) findings on teamwork skills in geosciences, whereby cross-disciplinary applicability can be observed in all collaborative teaching approaches. As noted in the students' reflective journals, Lahtaw (2024) corroborates the gradual shift from dependency to self-initiated problem-solving as an aspect of distinctiveness witnessed in this intervention. Guided autonomy as a transforming force in a learning setting was also asserted by Lahtaw (2024), stepping aside into the niche of integrating stress-relief with PBL – a novelty this intervention introduces and one not widely explored in earlier works. It is, thus, a transition from pure cognition into the emotional realm of learning because it enables students to address the various challenges an elaborate clinical environment presents, in which they must function (Hastuti et al., 2024; Putri et al., 2024). While these results corroborate the majority of the current literature, there are deviations in some cases. The enhancement of relatedness in this study was somewhat contrary to that of Chiu et al. (2021), who suggested that self-determination-theory-based interventions have a more limited influence on outcomes of collaborative learning in STEM education. One possible explanation for the differences would be that the industry has seemed so much focused on clinical environments, where anything other than relationships is hardly being considered. Furthermore, such differences among the experiences from instructor feedback fill the other gap indicated by Gilmore (2024) concerning the problems in applying inquiry-based learning across such diverse educational settings. This study's novelty, thus, lies in the combination of the high fidelity scores and the favorable evaluations by the instructors in respect to the practicality and scalability of this integrated model (Putri et al., 2024; Fatmanissa et al., 2022; Yanti & Susilo, 2023).

The project, therefore, seeks to address the aim from broad and complex angles, with the study enhancing self-determination and clinical competence in the use of PBL-TT while setting appropriate conditions for the sustainable bridging of the academic and clinical educational frameworks (Coté, 2024; Cummings et al., 2023; Searles, 2021; Yilmaz, 2022). Two perspectives on mentorship will facilitate further subgroup analysis to provide possible explanations for the interplay of equity in education.

Such a construction has theoretical and practical justification from the mixed-method validation, onto which future inquiries and implementations would be based. This work will set a new pathway for productive dialogue on the innovation of nursing education by demonstrating their viability and scalability via integrated PBL and Team Teaching. Theoretically, this presents a holistic framework because such an approach indeed enhances self-determination, competence, and resilience among nursing students (Widoro et al., 2024; Zainil et al., 2024). This will have implications on nursing education in particular and on any other educational system with a similar theory-practice divide that poses even greater challenges to bridge.

Conclusion

Nursing students will benefit in terms of self-determination, clinical competence, and problem-solving abilities when using both PBL and TT. Incorporation of inquiry-based learning through student-centered PBL along with mentorship structured around TT builds confidence, flexibility, and decision-making skills, especially in students who initially find it hard to learn on their own. Dual mentorship bridges the theory-practice gap within students to develop knowledge and hands-on experience in preparation for successful practice in the clinical world. They point out the necessity for inter-professional teamwork and reflection in nursing education, as well as structured scaffolding in independence. This research will require a quasi-experimental design, coupled with context-specific limitations, since there are culture-bound factors that affect generalization beyond specific conditions. Certainly, there will be no follow-up learning gains following graduation. Future studies should be conducted in longitudinal study designs, collaborative e-applications, and accompanied by complementary cost-benefit analyses, to determine how this best practice will be sustained. There will need to be an expectation that nursing curricula will evolve, just as healthcare practices evolve.

References

Attia, G. O., Sairany, Z., & Treacy, J. (2021). *DoD linguists' perceptions of the use of virtual learning environments on the motivation to speak a foreign language* [Doctoral dissertation, Augusta University]. ProQuest LLC. https://www.proquest.com/openview/1ec245036a1c1b2c0649c7cb54037798/1?cbl=18750&diss=y&pq-origsite=gscholar

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chang, C. Y., Hwang, G. J., & Gau, M. L. (2022). Promoting students' learning achievement and self-efficacy: A mobile chatbot approach for nursing training. *British Journal of Educational Technology*, *53*(1), 171–188. https://doi.org/10.1111/bjet.13158

Chiu, T. K. F., Chai, C. S., Williams, P. J., & Lin, T. J. (2021). Teacher professional development on self-determination theory-based design thinking in STEM education. *Educational Technology & Society*, *24*(4), 153–165. https://doaj.org/article/dfd5ecbd92314d8283d4bd0baa3eb4b8

Coté, L. E. (2024). *Characterization of teaching, mentoring, and career exploration during STEM undergraduate research experiences at universities and national laboratories across three studies* [Doctoral dissertation, University of California, Berkeley]. ProQuest LLC. https://escholarship.org/uc/item/39j1z553

Creswell, J. W., & Clark, V. L. P. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications. https://www.scirp.org/reference/referencespapers?referenceid=2697821

Cummings, M., Lawson, S., & Scaggs, D. (2023). *Principal leadership for social-emotional learning* [Doctoral dissertation, Saint Louis University]. ProQuest LLC.

Daniel, A. D., Negre, Y., Casaca, J., Patrício, R., & Tsvetcoff, R. (2024). The effect of game-based learning on the development of entrepreneurial competence among higher education students. *Education & Training*, *66*(8), 1117–1134. https://doi.org/10.1108/ET-10-2023-0448

Deci, E. L., & Ryan, R. M. (1991). *A motivational approach to self: Integration in personality*. In R. Dienstbier (Ed.), *Perspectives on motivation* (pp. 237–288). University of Nebraska Press. https://www.scirp.org/reference/referencespapers?referenceid=2528739

Denend, L., Spielman, S., Venook, R., Pamnani, R. D., Camarillo, D., Wall, J., & Towles, J. (2023). Using an accelerated undergraduate degree requires finding a course to build skills, inspire confidence, and promote interest in health technology innovation. *Biomedical Engineering Education*, *3*(2), 319–329. https://doi.org/10.1007/s43683-023-00109-3

Ding, C., Wang, Q., Zou, J., & Zhu, K. (2021). Implementation of flipped classroom combined with case- and team-based learning in residency training. *Advances in Physiology Education*, *45*(1), 77–83. https://doi.org/10.1152/advan.00022.2020

Fatmanissa, N., Siswono, T. Y. E., Lukito, A., Rahaju, E. B., & Ismail, I. (2022). Collaborative problem-solving in mathematics: A systematic literature review. *Pedagogika/Pedagogy*, *148*(4), 45–65. https://doi.org/10.15823/p.2022.148.3

Fergus, S. (2022). Are undergraduate students studying smart? Insights into study strategies and habits across a programme of study. *Journal of University Teaching and Learning Practice*, *19*(2), 110–123. https://doi.org/10.53761/1.19.2.8

Gilmore, C. E. (2024). *Exploring the effects of inquiry learning on teaching teams and ninth-grade students* [Doctoral dissertation, Arizona State University]. ProQuest LLC. https://keep.lib.asu.edu/items/195267

Hamilton, W. E., Jr. (2023). *English as a foreign language: Teachers' use of intercultural competence tests to inform teaching practice* [Doctoral dissertation, University of Arizona Global Campus]. ProQuest LLC. https://eric.ed.gov/?ff1=dtySince_2011&q=uses&ff2=eduAdult+Education&pg=2&id=ED640053

Hasan, M., Arisah, N., Supatminingsih, T., Ma'ruf, M. I., Aini, F. H., & Nurdiana, N. (2023). Project-based learning in economics learning: Can it improve 21st century skills through online learning? *Pedagogika/Pedagogy*, *152*(4), 5–27. https://doi.org/10.15823/p.2023.152.1

Hastuti, K. P., Arisanty, D., Basuki, S., Dharmono, D., & Rachman, A. (2024). Developing students' critical thinking skills through differentiated problem-based learning. *Pedagogy/Pedagogika*, *155*(3), 174–194. https://doi.org/10.15823/p.2024.155.9

Jusoh, A. J., Imami, M. K. W., Handrianto, C., Isa, A. N. M., Omar, S. Z., Abdullah, A., & Wahab, S. (2023). Verification the reliability and validity of a Malaysian version of rathus

assertiveness schedule as drug prevention scale. *Islamic Guidance and Counseling Journal*, *6*(2), 1–16. https://doi.org/10.25217/0020236369700

Kelley, M. A. (2024). *Preparing the future nutrition professional: Exploring the pedagogical benefits of active learning* [Doctoral dissertation, University of Minnesota]. ProQuest LLC. https://eric.ed.gov/?q=marketing+AND+skills+AND+food&ff1=dtySince_2020&id=ED658858

Kossybayeva, U., Shaldykova, B., Akhmanova, D., & Kulanina, S. (2022). Improving teaching in different disciplines of natural science and mathematics with innovative technologies. *Education and Information Technologies*, *27*(6), 7869–7891. https://doi.org/10.1007/s10639-022-10955-3

Lahtaw, D. R. (2024). *An exploration of government-approved primary to high school education in myanmar-finding room for Christian schooling in Kachin State* [Doctoral dissertation, Biola University]. ProQuest LLC. https://eric.ed.gov/?q=RA&id=ED651742

Milstead-Benabdallah, V. (2024). *Perceived problem behaviors in pre-kindergarten: The role of teacher-child racial match and teacher-child relationship* [Doctoral dissertation, University of Oklahoma]. ProQuest LLC. https://shareok.org/items/4c557c76-b833-456e-a46a-e300f1835f28

Nyarko, S. C. (2021). *In an era of soft skills: Investigating teamwork skills in the geosciences* [Doctoral dissertation, Western Michigan University]. ProQuest LLC. https://scholarworks.wmich.edu/dissertations/3801/

Putri, L. D., Rozi, M. F., Handrianto, C., & Rahman, M. A. (2024). A conceptual family partnership model with Paud institutions in developing the potential of early children based on blended learning. *Ensaio: Avaliação e Políticas Públicas em Educação*, *32*(125), e0244444. https://doi.org/10.1590/S0104-40362024003204444

Rogers, R. M., McCall, M. J., & Crowley, B. N. (2021). Implementing co-teaching: What mentors believe and what they do. *School-University Partnerships*, *14*(2), 105–114. Retrieved from https://eric.ed.gov/?id=EJ1327955

Sairany, Z., Attia, G. O., & Treacy, J. (2021). *DoD linguists' perceptions of the use of virtual learning environments on the motivation to speak a foreign language* [Doctoral dissertation, Augusta University]. ProQuest LLC.

Sanders, W., & McHugh, D. (2021). Pre-clerkship medical students' experiences and perspectives of system one and system two thinking: A qualitative study. *Education Sciences*, *11*(2), 1–15. https://doi.org/10.3390/educsci11020034

Scott, K. A. (2021). *Differentiated instruction and improving elementary student learning* [Doctoral dissertation, Walden University]. ProQuest LLC. https://scholarworks.waldenu.edu/dissertations/10366/

Searles, B. (2021). *A graduate-level immersive simulation program for teaching and assessing fundamental skills in entry-level clinical perfusionists* [Doctoral dissertation, Syracuse University]. ProQuest LLC. https://www.proquest.com/openview/41fed6dc9923737b3cc9255e9ec032e1/1?cbl=18750&diss=y&pq-origsite=gscholar

Smith, S. N. (2024). *Experiences and self-efficacy of facilitator training in problem-based learning: A qualitative case study* [Doctoral dissertation, Northcentral University]. ProQuest LLC. https://doi.org/10.1016/j.nedt.2009.12.017

Sunarti, V., Jamaris, J., Solfema, S., Iswari, M., Hidayati, A., Handrianto, C., & Rahman, M. A. (2024). Evaluating the effectiveness of a blended learning system for developing technological pedagogical content knowledge (TACK) in community educators. *Encontros Bibli*, *29*, e96419. https://doi.org/10.5007/1518-2924.2024.e96419

Waty, E. R. K., Nengsih, Y. K., Handrianto, C., & Rahman, M. A. (2024). The quality of teacher-made summative tests for Islamic education subject teachers in Palembang Indonesia. *Cakrawala Pendidikan: Jurnal Ilmiah Pendidikan*, *43*(1), 192–203. https://doi.org/10.21831/cp.v43i1.53558

Welch Bacon, C. E., Nottingham, S. L., & Kasamatsu, T. M. (2024). Development and validation of an active educational resource to address quality gaps regarding clinical documentation. *Athletic Training Education Journal*, *19*(1), 1–9. https://doi.org/10.4085/1062-6050-015.23

Wellhofer, L., & Luhken, A. (2022). Problem-based learning in an introductory inorganic laboratory: Identifying connections between learner motivation and implementation. *Journal of Chemical Education*, *99*(2), 864–873. https://doi.org/10.1021/acs.jchemed.1c00808

Widoro, E., Situmorang, R., & Chaeruman, U. A. (2024). Challenges of peer tutoring in different role organization settings in higher education: Systematic literature review. *Pedagogy/Pedagogika*, *155*(3), 68–87. https://doi.org/10.15823/p.2024.155.4

Yanti, Y. E., & Susilo, H. (2023). Learning cycle-inquiry effect on pre-service elementary teachers' science process skills and content knowledge. *Pedagogika/Pedagogy*, *152*(4), 169–187. https://doi.org/10.15823/p.2023.152.9

Yilmaz, H. S. (2022). A study of the determination of benchmarks during the new formation of integrated STEM leader preparation program. *European Journal of STEM Education*, *7*(1), 1–13. https://doi.org/10.20897/ejsteme/12634

Zainil, M., Kenedi, A. K., Rahmatina, Indrawati, T., & Handrianto, C. (2024). The Influence of STEM-Based Digital Learning on 6C Skills of Elementary School Students. *Open Education Studies*, *6*(1), 1–17. https://doi.org/10.20448/jeelr.v10i1.4336

Naujas komandinis probleminio mokymosi modelis slaugos studentų savarankiškumui stiprinti: jo plėtojimas ir validumas

Rhona Sandra[1], Firman Firman[2], Abdul Razak[3], Ciptro Handrianto[4]

[1] Valstybinio Padango universiteto absolventų mokykla, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padangas, Sumatera Barat, IDN-25171, Indonezija, sandra.rhona@yahoo.com

[2] Valstybinio Padango universitetas, Vadovavimo ir konsultavimo skyrius, Švietimo fakultetas, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padangas, Sumatera Barat, IDN-25171, Indonezija, firman@fip.unp.ac.id

[3] Valstybinis Padango universitetas, Biologijos katedra, Matematikos ir gamtos mokslų fakultetas, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padangas, Sumatera Barat, IDN-25171, Indonezija, ar210371@fmipa.unp.ac.id

[4] Valstybinis Padango universitetas, Neformaliojo ugdymo katedra, Švietimo fakultetas, Jl. Prof. Dr. Hamka, Air Tawar Barat, Kota Padangas, Sumatera Barat, IDN-25171, Indonezija, handrianto@unp.ac.id

Santrauka

Šio tyrimo tikslas – sukurti ir patvirtinti studentų probleminio mokymosi modelį (angl. *PBL*) ir komandinio mokymo metodą, siekiant klinikinės praktikos metu motyvuoti slaugos studentus mokytis savarankiškai. Šioje situacijoje išryškėja teoriškai išmoktų dalykų praktinio pritaikymo spraga, kurią ir siekiama išspręsti šiuo tyrimu. Tai yra neatidėliotinas atsakas į neatidėliotiną raginimą taikyti inovatyvias slaugos ugdymo strategijas, susiejančias mokymąsi su klinikiniu darbu praktikoje, akcentuojant savarankiškų ir kompetentingų sveikatos priežiūros specialistų ugdymą. Tyrime taikyti mišrūs metodai ir kvazieksperimentinis dizainas. Tyrime dalyvavo keturių Indonezijos slaugos mokyklų 160 slaugos studentų, 20 klinikinių instruktorių ir 10 akademinių dėstytojų. Iš viso 16 mėnesių buvo vykdomos integruotos intervencijos, kurių metu dalyviai buvo įdarbinti taikant savarankiškumo skalę, klinikinės veiklos vertinimą, tikslinių grupių diskusijas ir pusiau struktūruotus interviu. Rezultatai parodė, kad PBL ir komandinio mokymo derinys duoda vadinamąjį „dvigubo rezonanso efektą“, t. y. akademinė ir klinikinė perspektyvos palaiko viena kitą stiprindamos studentų savarankiškumą ir klinikinę kompetenciją. Šis novatoriškas metodas yra geras naujas slaugos mokymo modelis, skatinantis vidinę motyvaciją ir profesinį augimą. Integruoti pedagoginiai metodai yra konkretus pagrindas slaugos studentų savarankiškumui ir klinikinei kompetencijai stiprinti.

Esminiai žodžiai: *savarankiškumas, probleminis mokymasis, klinikinis slaugos ugdymas, komandinis mokymas.*

Gauta 2025 01 23 / Received 23 01 2025
Priimta 2025 03 14/ Accepted 14 03 2025