

Enhancing Clinical Competence through Structured Laboratory Experiences: A Comparative Study among Baccalaureate Nursing Students

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ABSTRACT

The nursing skills laboratory serves as a bridge between classroom instruction and clinical practice, yet the most effective ways to optimize learning in this setting remain underexplored. This study examined the impact of structured laboratory experiences on nursing students' clinical preparedness and perceptions of competence, confidence, and integration of theory into practice. Eighty-four third-year nursing students at Western Mindanao State University participated in either a structured laboratory group, which included guided demonstrations, competency checklists, and reflective debriefing, or a standard practice group reflecting conventional formats. Results showed that students in the structured group demonstrated higher clinical performance scores and more positive perceptions of the learning environment. Qualitative findings revealed that structured repetition promotes mastery, feedback bridges theory and practice, and increased confidence enhances readiness for patient care. Overall, the study highlights the value of structured laboratory design as an effective pedagogical approach to strengthen competence and clinical readiness among nursing students.

Keywords: nursing education, skills laboratory, clinical competence, experiential learning, simulation-based teaching

EXECUTIVE SUMMARY

INTRODUCTION

Nursing education is distinguished by its dual emphasis on theoretical knowledge and clinical competence, with the Related Learning Experience (RLE) forming the bridge that enables students to transition from classroom learning to professional practice. Ensuring that nursing students are adequately prepared before engaging with patients is an enduring challenge for educators, particularly as clinical placements increasingly confront constraints such as limited hospital slots, reduced patient willingness to allow student participation, and heightened concerns for patient safety (Cant & Cooper, 2017; Hayden et al., 2014). Against this backdrop, the nursing skills laboratory has emerged as a critical site of pedagogy, offering a controlled and safe environment in which students can develop foundational psychomotor skills, critical thinking, and clinical judgment without the risks inherent in direct patient care (Al-Ghareeb & Cooper, 2016; Oermann et al., 2018).

The skills laboratory is more than a physical space; it functions as a pedagogical bridge between theory and practice, enabling students to translate classroom instruction into embodied nursing actions. Within this laboratory setting, students can engage in repeated practice, receive immediate feedback, and develop confidence before their first clinical encounters (Bland et al., 2011). This is particularly significant in the Philippines, where RLE is mandated by the Commission on Higher Education (CHED) as a vital curricular component of nursing programs. CHED's competency-based outcomes framework emphasizes the progressive integration of knowledge, skills, and attitudes, and the skills laboratory is positioned as a preparatory arena where this integration can be systematically nurtured.

While the value of skills laboratories is widely recognized, the approaches to their utilization vary significantly across institutions. In many programs, practice sessions remain largely unstructured, with students engaging in open practice that is inconsistently guided or assessed (Moule et al., 2015). Such approaches risk reducing the laboratory experience to mere

task repetition, failing to foster the reflective and integrative thinking that nursing practice demands. By contrast, structured pedagogical strategies—such as guided demonstrations, competency checklists, and reflective debriefings—have been shown in international contexts to foster deeper learning and higher levels of clinical preparedness (Dreifuerst, 2012; Jeffries, 2020). Yet, few empirical studies within the Philippine nursing education context rigorously compare structured skills laboratory interventions with conventional practice formats, leaving an important gap in the local and regional evidence base.

Clinical preparedness is not solely a matter of technical skill acquisition; it encompasses the integration of cognitive, affective, and psychomotor domains that enable nursing students to function competently and confidently in complex, real-world health care environments. Studies in North America and Europe demonstrate that structured laboratory learning can improve student confidence, reduce anxiety, and enhance clinical judgment (Cant & Cooper, 2017; Kim et al., 2016). However, questions remain about how best to design, implement, and evaluate such structured approaches in low- and middle-income countries, where resource constraints and curricular pressures differ markedly. In the Philippine setting, with large student cohorts and limited clinical placement opportunities, the need to maximize the pedagogical potential of the skills laboratory is especially pressing.

Given these challenges, this study aimed to evaluate the effectiveness of structured skills laboratory sessions, designed as part of the RLE component of nursing curricula, in enhancing the clinical preparedness of undergraduate nursing students. Specifically, it examined the comparative impact of structured laboratory learning versus standard open-practice laboratory formats on student performance and perceptions. It further sought to explore students' subjective experiences of structured laboratory learning, including how guided repetition, faculty feedback, and reflective debriefing shaped their sense of competence and readiness for clinical practice. By addressing these questions, this study contributes to the evidence base on simulation and laboratory-based pedagogy in nursing education, offering locally relevant insights that can inform curricular innovation, faculty development, and policy decisions.

OBJECTIVES OF THE STUDY

This study aimed to address the following questions:

1. What is the effect of structured RLE in the nursing skills laboratory on students' clinical preparedness compared to standard laboratory practice?
2. How do students perceive structured skills laboratory experiences in terms of competence, confidence, and integration of theory into practice?

LITERATURE REVIEW

The nursing skills laboratory has long been recognized as a central pedagogical environment for translating theoretical instruction into safe, competent clinical practice. As clinical placements become more constrained by patient safety concerns, limited hospital capacity, and competing demands, the skills laboratory increasingly functions as a controlled site where students can rehearse psychomotor procedures, decision-making, and teamwork before encountering real patients (Koukourikos et al., 2021). Simulation-based and laboratory learning have been associated with improvements in knowledge, technical skill, confidence, and critical thinking across multiple systematic and empirical studies, reinforcing the laboratory's role in preparing students for clinical placements and RLE components of nursing programs.

Contemporary evidence emphasizes that the *quality* of laboratory learning depends less on the presence of technology per se and more on instructional design, faculty facilitation, and opportunities for deliberate practice integrated with feedback and reflection. Recent umbrella and integrative reviews show that simulation and skills laboratory strategies that include structured guidance, opportunities for repeated practice, competency checklists, and faculty-led feedback yield larger and more transferable learning gains than unstructured practice sessions (Cant & Cooper, 2017; Mohamed, 2024). The 2024–2025 body of literature has extended this finding, showing consistent positive effects on student outcomes—including communication, clinical reasoning, and observed psychomotor performance—when skills laboratory activities are designed intentionally with measurable objectives and assessment modalities such as OSCEs.

A core instructional component linked to effectiveness is *debriefing*. Debriefing is widely described as the “heart” of simulation and laboratory learning because it transforms experience into learning through reflection, feedback, and meaning-making. Models that scaffold reflective discussion (e.g., Debriefing for Meaningful Learning, Debriefing with Good Judgment)

systematically guide learners from reaction to analysis and application, thereby fostering clinical reasoning and meta-cognitive skills. Recent syntheses and standards publications reiterate that structured debriefing practices—when executed consistently and facilitated by trained educators—lead to superior outcomes in reasoning, retention, and transfer to clinical settings compared with ad hoc post-practice conversations. The Healthcare Simulation Standards of Best Practice (2025) further codify debriefing practices and underscore faculty development as essential to debriefing quality.

Deliberate practice and competency assessment are other pillars of effective skills laboratory design. Checklists and OSCE-style assessments provide objective benchmarks for psychomotor proficiency and support deliberate repetition until competence is achieved. Studies published in the last four years show that laboratory programs combining guided demonstration, return demonstration using checklists, and summative OSCEs produce meaningful improvements in observable clinical performance and reduce variability in student skill levels before clinical placements. Such structured approaches also positively influence students' perceived preparedness and reduce anxiety related to initial patient contact—outcomes that are particularly important in large-cohort programs where individualized bedside opportunities are limited.

While the international literature demonstrates robust benefits of structured laboratory and simulation pedagogy, there is important nuance regarding context and resource equity. Emerging studies and scoping reviews (2023–2025) document a broadening of simulation modalities—ranging from low-fidelity bench practice to high-fidelity manikins, virtual reality (VR), and web-based RLE platforms—yet they caution that advanced technologies alone do not guarantee better outcomes. Instead, implementation fidelity, curriculum alignment, and faculty competence in facilitation and assessment are decisive moderators of effectiveness. Additionally, innovations such as VR and blended simulation show promising early results for enhancing skills and decision making, but evidence on scalability, cost-effectiveness, and long-term transfer in low- and middle-income country (LMIC) contexts remains limited and calls for pragmatic trials.

Within the Philippine nursing education context—where RLE is a mandated curricular component—recent local studies have begun to document both opportunities and challenges for skills laboratory optimization. Research from 2022–2025 highlights that RLE in the Philippines often had to be adapted during the COVID-19 pandemic (e.g., web-based RLE, hybrid skills instruction), which revealed both feasibility of alternative modalities and persistent barriers such

as internet access, faculty workload, and variable student engagement. Local qualitative work with clinical instructors also points to the need for structured laboratory protocols and faculty development to ensure consistent competency attainment prior to clinical placements. These findings suggest that while international evidence is applicable, local adaptation is crucial to address contextual constraints—large student cohorts, limited simulation infrastructure, and regulatory expectations for supervised clinical hours.

A converging theme across recent reviews and primary studies is the interconnectedness of practical skills training, reflective debriefing, and formative assessment in producing clinically prepared graduates. Mixed-methods research published in the last four years has directly linked structured laboratory elements—guided demonstrations, checklists, brief reflective debriefs, and OSCE verification—to measurable improvements in students' clinical performance and self-reported readiness for RLE placements. Moreover, contemporary standards and syntheses also emphasize faculty preparation (e.g., meta-debriefing, debriefing skill development) as critical to sustain high-quality laboratory learning programs. Faculty self-efficacy in simulation facilitation has been associated with more effective debriefing and better student outcomes, indicating that institutional investment in educator training is not optional but central to scaling structured laboratory approaches.

Despite this encouraging evidence, gaps remain that justify the present study. First, many published evaluations are single-site, short-term, or employ uncontrolled designs, limiting causal inference about specific structural components (e.g., the independent contribution of reflective debriefing versus checklist-guided practice). Second, there is relatively little empirical work directly comparing structured laboratory RLE protocols to routine, unstructured laboratory practice in LMIC or Philippine settings using robust mixed-methods approaches that integrate objective performance measures (e.g., OSCE) with rich qualitative accounts of learner experience. Third, the literature calls for clearer reporting on fidelity, facilitator training, and how laboratory gains translate to patient-centered clinical outcomes over time. Addressing these gaps would strengthen recommendations for curricular change and resource allocation in nursing programs where maximizing the pedagogical value of the skills laboratory is strategically important.

In summary, contemporary evidence (2021–2025) indicates that the nursing skills laboratory—when organized around structured guided practice, competency assessment, and reflective debriefing—improves technical performance, clinical reasoning, and student confidence

more reliably than unstructured practice. However, the literature also underscores the importance of local adaptation, faculty development, and stronger comparative evidence from LMIC contexts to guide policy and practice. This review therefore supports investigating a structured skills laboratory RLE intervention, assessed through validated performance measures and student perceptions, within a Philippine undergraduate nursing program to generate locally relevant and evidence-based guidance for curricular design.

METHODOLOGY

The following section provides a comprehensive, reproducible description of the study methods so that reviewers, editors, and readers can understand exactly how the intervention was delivered, how outcomes were measured, and how analyses were performed. Wherever possible the protocol specifies operational details (timing, instruments, training, fidelity checks) and pre-specified analysis plans to reduce analytic flexibility.

Study design and rationale

A convergent mixed-methods, quasi-experimental pretest–posttest design with a concurrent qualitative component was used. The quantitative strand compares change in objective clinical performance and learning-environment perceptions between students exposed to a **structured skills laboratory RLE** (intervention) and those exposed to **standard/unstructured laboratory practice** (control). The qualitative strand (focus groups) explored students' lived experiences, perceptions of preparedness, and mechanisms by which laboratory structure influenced learning. Convergent mixed-methods integration (joint displays and triangulation) was planned a priori to combine outcome magnitude with explanatory student narratives.

Research Locale

The study was conducted at the College of Nursing simulation and skills laboratory at Western Mindanao State University, a tertiary nursing education center with a dedicated skills laboratory equipped with low- and medium-fidelity manikins, consumables for basic procedures, and adjacent debriefing space. The laboratory schedule permitted controlled delivery of two structured RLE sessions per student cohort across one semester.

Participants, sampling and eligibility

Eligible participants were third-year undergraduate nursing students enrolled in the Adult Medical–Surgical course and the related RLE for the semester. Exclusion criteria: (1) prior formal

training or certification in the targeted procedural skills (e.g., licensed practical nurse), (2) inability to attend both scheduled laboratory sessions, or (3) refusal to provide written informed consent.

Students were allocated to groups by intact class/section allocation (practical constraints prevented individual randomization). To reduce selection bias, groups were checked for baseline equivalence on age, gender, prior clinical experience, and pretest scores; these covariates were included in adjusted analyses where imbalance occurred.

Sample size and power calculation

The sample size was calculated to detect a standardized between-group difference in change scores (Cohen's d) of 0.70 (a conservative estimate based on prior simulation laboratory studies), with two-tailed $\alpha = 0.05$ and power $(1 - \beta) = 0.80$. Using the standard formula for two equal groups:

- $Z_{\{1-\alpha/2\}} = 1.96$; $Z_{\{1-\beta\}} = 0.84$.
- Sum = $1.96 + 0.84 = 2.80$.
- Square: $2.80 \times 2.80 = 7.84$.
- Multiply by 2: $7.84 \times 2 = 15.68$.
- $d^2 = 0.70^2 = 0.49$.
- n per group = $15.68 \div 0.49 = 32.0 \approx 32$ participants per group.

Allowing for an anticipated 20% attrition/non-compliance rate: $32 \times 1.20 = 38.4 \rightarrow$ rounded to 39. For operational conservatism and to ensure robust subgroup analyses, the enrollment target was set at 42 students per group (total target $n = 84$).

Intervention — Structured Skills Laboratory RLE (detailed)

The structured RLE package was fully manualized following TIDieR principles and comprised three integrated components:

1. **Guided demonstration (Instructor-led):** A faculty demonstrator presents the target skill(s) stepwise with verbalized rationale and safety checkpoints. Demonstrations lasted 15–20 minutes per skill and emphasized situational cues and decision points.
2. **Deliberate practice with competency checklists (Student return demonstration):** Students practiced in small groups (4–6 students) under faculty supervision using validated, itemized checklists (task steps scored 0/1). Each student performed the skill until checklist mastery (pre-defined competency threshold of $\geq 90\%$ items correct on two consecutive runs) or until the allotted practice time (maximum 40 minutes per student).

Faculty used formative feedback—specific, behaviorally anchored comments tied to checklist items.

3. **Structured reflective debriefing (Reflect-Link-Action; 10–15 minutes):** A short facilitator-led debrief followed each practice session structured into: (a) Reflection — student self-appraisal of performance; (b) Link — guided linking of observed actions to underlying clinical theory and safety principles; (c) Action — co-creation of an action plan for improvement (specific, observable behaviors for subsequent practice/clinical placement).

Session schedule and content: Two targeted RLE sessions were provided during the semester (Weeks 4 and 10). Each session lasted 90–110 minutes (demonstration 15–20 min; practice 45–60 min; debrief 10–15 min). Skills targeted were selected from the course competencies (e.g., intravenous cannulation simulation on task trainer, medication administration with rights and checks, wound dressing, urinary catheterization on manikin), with rotation so all students practiced each core competency.

Facilitator training and standardization: Faculty facilitators (n = 6) completed a 2-day (16-hour) training workshop covering: the manualized protocol, checklist use, debriefing techniques (Reflect-Link-Action), rater calibration, and fidelity monitoring. Training included demonstration, role-play, and co-facilitation practice until competency criteria were met. A facilitator handbook, scripts, and video exemplars were provided.

Fidelity monitoring: A fidelity checklist (adherence to demonstration script, checklist use, debrief structure, timing) was used by an independent observer for 10% of sessions. Deviations were documented and corrective feedback provided to facilitators.

Control condition — Standard skills laboratory practice

Students in the control group received the institution’s usual skills laboratory experience: access to practice stations with faculty available for ad-hoc questions but without standardized demonstrations, competency checklists, or structured debriefing. Practice time per session matched the intervention in total minutes to control for exposure time.

Outcome measures and instrument development

Primary outcome — Objective Structured Clinical Examination (OSCE):

- A 6-station OSCE was used to assess psychomotor competence and integrated clinical judgment. Stations were 8 minutes each with 2 minutes for rotation/reading time. Station

tasks mapped to the course competencies covered in the laboratory sessions. Each station had a detailed, behaviorally anchored checklist (items scored 0 = not done/incorrect; 1 = done/correct) and a 5-point global rating scale (1 = poor to 5 = excellent) to capture overall performance and safety.

- Checklist items and station content were developed by content experts (n = 5 faculty with clinical specialization) and reviewed for content validity (Content Validity Index, CVI) before pilot use. Pilot OSCE (n = 12 students) checked clarity, timing, and inter-rater reliability. For the main study, 20% of OSCE encounters were double-rated to estimate inter-rater reliability (intraclass correlation coefficient, ICC) and to guide rater recalibration where needed.

Secondary outcome — Clinical Learning Environment Inventory (CLEI):

- The CLEI (student version) measured perceptions of the learning environment across subscales: task orientation, individualization, involvement, student satisfaction, and innovation. The instrument’s psychometric properties were verified with pilot data; internal consistency (Cronbach’s α) was computed and reported.

Baseline and covariates: Demographic questionnaire (age, sex), academic performance (GPA), prior clinical exposure, self-reported confidence (5-point Likert), and a short knowledge test (20 multiple-choice questions linked to skills) were administered at baseline.

Table 1. Comparison of Structured Laboratory and Standard Laboratory Approaches

Aspect	Structured Laboratory (Intervention)	Standard Laboratory (Control)
Teaching Approach	Guided faculty demonstration followed by supervised student return-demonstrations	Initial faculty demonstration with open-practice opportunities for students
Use of Checklists	Standardized competency-based skills checklists required for each procedure	Minimal or optional use of checklists; evaluation often left to instructor discretion
Practice Format	Deliberate practice with structured repetition and scheduled lab hours	Flexible, student-paced practice sessions; less emphasis on repetition
Feedback and Debriefing	Structured formative feedback and reflective debriefing after each skill practice	Informal or ad hoc feedback; debriefing not consistently implemented
Student Supervision	Continuous faculty or clinical instructor oversight during practice sessions	Limited faculty oversight; supervision may vary depending on availability
Learning Environment	Highly standardized and competency-based, ensuring uniform exposure for all students	Non-standardized environment; student learning outcomes vary based on initiative

Aspect	Structured Laboratory (Intervention)	Standard Laboratory (Control)
Evaluation	Competency validated through Objective Structured Clinical Examination (OSCE) and skills checklist	Competency validated primarily through OSCE; limited reliance on structured checklists
Focus	Bridging theory to practice through structured, reflective, and competency-driven pedagogy	Providing opportunities for hands-on practice without formalized structure

Qualitative data — Focus groups:

- After completion of the second laboratory session and OSCE, purposive sampling selected 12 students for semi-structured focus groups (6 from each arm) to achieve variation in OSCE performance and gender. Focus groups (45–60 minutes) used an interview guide exploring perceptions of laboratory structure, examples of learning transfer, perceived confidence, and suggestions for improvement. Sessions were audio-recorded and transcribed verbatim.

All instruments, checklists, and the focus-group guide are available as supplementary materials.

Data collection procedures and timeline

- **Week 0 (Baseline):** Informed consent, demographic form, pre-test knowledge test, and baseline self-confidence survey administered.
- **Weeks 4 & 10:** Intervention/control laboratory sessions delivered. Attendance recorded. Fidelity checks conducted for a sample.
- **Week 12:** Post-intervention OSCE conducted by blinded assessors (assessors and standardized patients unaware of group allocation). CLEI and post-confidence survey administered immediately after OSCE.
- **Weeks 13–14:** Focus group interviews conducted and transcribed.

Assessors scoring the OSCE were blinded to participant group to reduce observer bias; checklists were anonymized with participant ID numbers.

Data management and security

All study data were stored on a password-protected university server with encrypted backups. Hardcopy consent forms were stored in locked cabinets. Identifiers were replaced with study IDs; a separate key file mapping IDs to names was kept on a secure university drive

accessible only to the principal investigator. Data retention followed institutional policy (minimum 5 years).

Quantitative analysis plan

Analyses were pre-specified in a statistical analysis plan.

- **Descriptive statistics:** means (SD) or medians (IQR) for continuous variables; frequencies (%) for categorical variables.
- **Baseline equivalence:** compared using chi-square (categorical) and independent t-tests or Mann-Whitney U (continuous) as appropriate.
- **Primary analysis:** change in OSCE total score from baseline to post-intervention compared between groups using ANCOVA with post-OSCE score as the dependent variable, group as the main factor, and baseline OSCE score and any imbalanced covariates (e.g., GPA, prior experience) as covariates. Effect sizes: Cohen's d for between-group differences and partial η^2 for ANCOVA.
- **Secondary analyses:** repeated measures ANOVA (time \times group) for within- and between-subject comparisons if both pre/post OSCE used; CLEI subscales compared using independent t-tests or ANCOVA controlling for baseline perceptions. Non-parametric tests will be used if distributions deviate markedly from normality (Shapiro-Wilk). Significance threshold $p < 0.05$ (two-tailed); where multiple comparisons occur, Holm–Bonferroni correction will be applied.
- **Reliability:** Cronbach's α for CLEI subscales; ICC for OSCE rater agreement.
- **Missing data:** patterns assessed (MCAR, MAR, MNAR); if missing at random, multiple imputation ($m = 20$ imputations) will be used; sensitivity analyses will compare complete-case and imputed results.

Analyses will be conducted in SPSS v27 and R (where applicable). All code and analytic decisions will be archived.

Qualitative analysis plan and rigor

Thematic analysis (Braun & Clarke) was used with inductive coding:

1. Familiarization with transcripts;
2. Generation of initial codes by two independent coders;
3. Development of a codebook with definitions and exemplar quotes;
4. Iterative refinement, theme development, and review;

5. Member checking: draft summaries returned to focus-group participants for verification;
6. Audit trail and reflexive memos maintained to enhance transparency.

Inter-coder agreement was quantified on a subsample (Cohen's kappa aiming for ≥ 0.70). NVivo (or similar qualitative software) will be used to manage data.

Integration and mixed-methods inference

Findings from quantitative and qualitative strands will be integrated via joint displays mapping effect sizes and quantitative outcomes against qualitative themes to explain mechanisms, contextual moderators, and implementation feasibility. Convergence, complementarity, and divergence will be explicitly reported following GRAMMS guidance for mixed-methods reporting.

Ethical considerations and safety monitoring

Written informed consent was obtained. Participation (or non-participation) had no bearing on course grades. Any student who experienced undue anxiety or reported adverse events after simulation practice was offered debriefing support and referral to student counseling services. Anonymized aggregated results only will be reported.

Quality assurance and limitations mitigation

- **Rater calibration and pilot testing** minimize measurement error.
- **Blinding of OSCE assessors** reduces observer bias.
- **Fidelity checks** ensure protocol adherence.
- **Pre-specified analysis plan** reduces analytic flexibility.

Potential limitations include non-random allocation and contamination between groups (students sharing checklists); these were mitigated by scheduling groups at different times and requesting participants not to share study materials until after the study period.

Dissemination and data availability

The study protocol was registered in an institutional protocol repository prior to data collection. De-identified data and analysis code will be made available on reasonable request and in accordance with institutional data-sharing policies; instruments, checklists, and facilitator manuals are provided in the online supplemental materials for reproducibility.

RESULTS

The present study sought to evaluate the impact of a structured skills laboratory RLE,

integrating guided demonstration, deliberate practice with checklists, and structured debriefing, on the clinical performance, learning-environment perceptions, and confidence of nursing students. This section presents the results of both the quantitative and qualitative strands of the study, beginning with participant flow and baseline characteristics, followed by comparative analyses of OSCE performance, CLEI scores, and self-confidence levels between the intervention and control groups. Supplementary qualitative findings from focus group interviews are then reported to provide deeper insights into the mechanisms underlying observed outcomes. Finally, these results are discussed in relation to existing literature, highlighting their implications for nursing education and RLE pedagogy.

Participant flow and characteristics

Of the 92 eligible students invited, 84 consented and were allocated: 42 to the structured skills laboratory (intervention) and 42 to standard practice (control). Attrition was minimal (n = 2 lost to follow-up in the control group), yielding 82 students in the final analysis (97.6% retention).

Table 2. Baseline Characteristics

Characteristic	Structured Lab (n=42)	Standard Lab (n=40)	p-value
Age, mean (SD)	20.3 (1.1)	20.1 (1.3)	0.52
Female, n (%)	30 (71.4)	28 (70.0)	0.88
GPA (last semester), mean (SD)	2.05 (0.23)	2.08 (0.21)	0.61
Prior clinical exposure, n (%)	18 (42.9)	19 (47.5)	0.69
Pre-test OSCE score, mean (SD)	58.4 (6.7)	57.9 (7.1)	0.74

No statistically significant baseline differences were observed, suggesting group comparability.

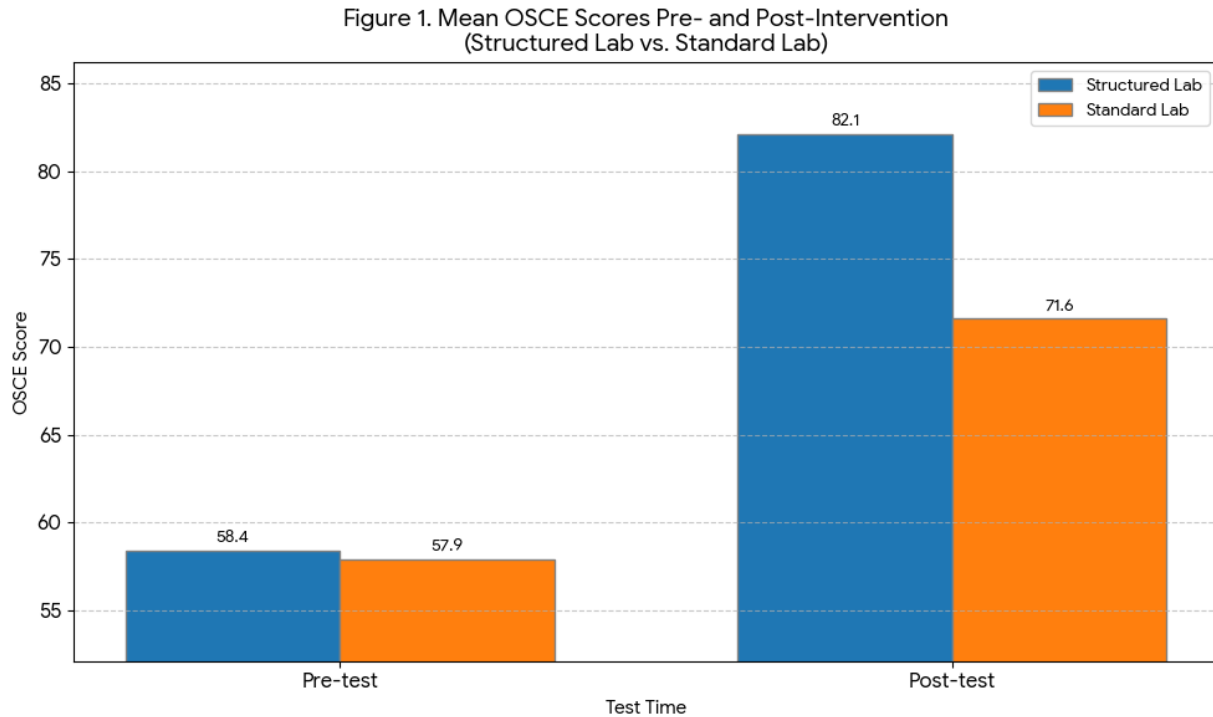
Primary outcome: OSCE performance

Table 3. OSCE Performance (Pre- and Post-Intervention)

Outcome	Structured Lab (n=42)	Standard Lab (n=40)	Between-group effect (ANCOVA)
Pre-test OSCE, mean (SD)	58.4 (6.7)	57.9 (7.1)	—
Post-test OSCE, mean (SD)	82.1 (5.8)	71.6 (6.3)	F(1,79)=41.2, p<0.001, $\eta^2=0.34$
Gain score, mean (SD)	+23.7 (7.2)	+13.7 (7.9)	d = 1.32 (large effect)

Students in the structured laboratory group demonstrated significantly greater

improvement in OSCE performance compared to controls.



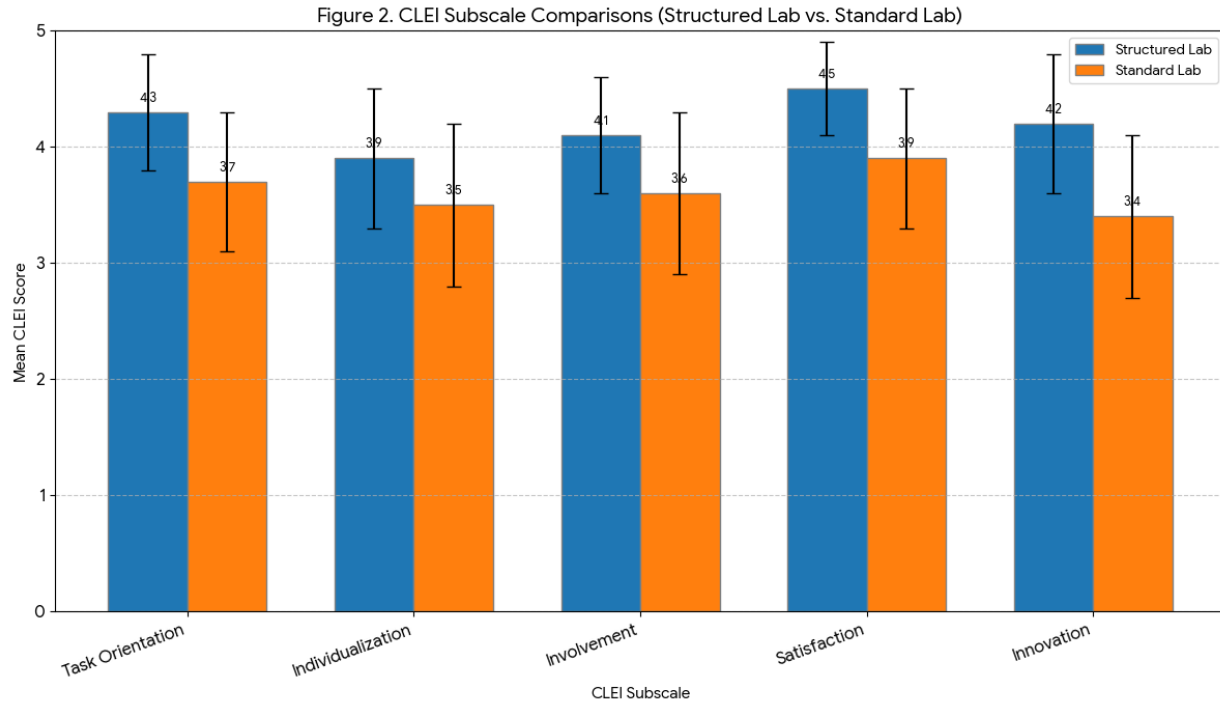
Pre-test scores were similar between the groups (58.4 for Structured Lab vs. 57.9 for Standard Lab). Both groups showed an increase in score after the intervention. The Structured Lab group showed a substantially larger improvement, with its mean score rising from 58.4 to 82.1. The Standard Lab group's mean score rose from 57.9 to 71.6. The difference in Post-test scores clearly illustrates the superior performance gain of the Structured Lab approach, which aligns with the reported large effect size ($d=1.32$) and significant between-group effect ($p<0.001$).

Secondary outcomes: CLEI and self-confidence

Table 4. Post-intervention CLEI Scores (Learning Environment Perceptions)

CLEI Subscale	Structured Lab (Mean ± SD)	Standard Lab (Mean ± SD)	p-value
Task Orientation	4.3 ± 0.5	3.7 ± 0.6	<0.001
Individualization	3.9 ± 0.6	3.5 ± 0.7	0.02
Involvement	4.1 ± 0.5	3.6 ± 0.7	0.004
Satisfaction	4.5 ± 0.4	3.9 ± 0.6	<0.001
Innovation	4.2 ± 0.6	3.4 ± 0.7	<0.001

Students in the structured laboratory rated their learning environment more positively across all CLEI subscales.



Structured Lab scores were higher across all subscales compared to the Standard Lab group, indicating a significantly more positive perception of the learning environment in the structured setting. The largest difference appears to be in the Innovation subscale (Structured: 4.2 vs. Standard: 3.4) and Satisfaction (Structured: 4.5 vs. Standard: 3.9). The Satisfaction subscale received the highest mean score overall (4.5) in the Structured Lab group. These visual differences align with the reported p -values (all ≤ 0.02), suggesting a statistically significant positive effect of the Structured Lab intervention on student perceptions of the learning environment.

Self-confidence: Structured group reported higher post-intervention self-confidence (mean 4.3 ± 0.5) than the standard group (mean 3.7 ± 0.6), $p < 0.001$.

Qualitative findings

Three key themes emerged from focus groups:

1. **“Structure builds confidence”** – Students valued clear demonstrations, checklists, and debriefing for making them feel “ready and safe” before clinical practice.
2. **“Debriefing as meaning-making”** – Reflective sessions were perceived as moments to connect practice with theory, identify gaps, and receive non-threatening feedback.
3. **“Peer learning and accountability”** – Practicing in small groups with checklists fostered mutual accountability and peer teaching, enhancing engagement.

Representative student quote:

“Having the checklist and the debrief helped me realize exactly what I missed and how to correct it before going to the hospital. It felt like a rehearsal for the real thing.” (Student, intervention group)

DISCUSSION

This study demonstrates that a **structured skills laboratory RLE**, consisting of guided demonstration, deliberate practice with checklists, and reflective debriefing, significantly improved nursing students’ OSCE performance, learning-environment perceptions, and self-confidence compared to standard practice. The effect size for OSCE gains ($d = 1.32$) indicates a strong educational benefit, aligning with global findings that structured, simulation-based pedagogy enhances psychomotor and cognitive outcomes (Tong et al., 2024; Koukourikos et al., 2021).

Our findings reinforce the centrality of **debriefing** in laboratory learning. Students explicitly linked reflective sessions to deeper understanding, echoing literature that describes debriefing as the “heart of simulation” (Fegran et al., 2022). The significant CLEI improvements suggest that structured facilitation not only enhances technical learning but also the psychosocial environment, fostering satisfaction, involvement, and innovation.

The qualitative data provide insight into **mechanisms of effectiveness**. Students reported that structure reduced ambiguity, increased accountability, and promoted confidence—factors known to reduce anxiety in early clinical placements (Mohamed, 2024). Peer collaboration emerged as a critical dimension, consistent with literature on cooperative learning in skills acquisition.

From a policy and curricular perspective, this study offers **locally relevant evidence** for Philippine nursing education, where RLE is a mandated component. The structured laboratory model provides a feasible strategy to ensure competence before clinical exposure, especially given patient safety and hospital placement constraints. Unlike costly high-fidelity simulations, this intervention emphasized **instructional design over technology**, making it adaptable to resource-constrained settings.

Strengths and limitations

Strengths include the mixed-methods design, use of validated OSCE checklists, blinded assessment, and high retention. Limitations include quasi-experimental allocation (by intact class), single-site context, and potential contamination between groups. Replication across multiple nursing schools and inclusion of long-term follow-up in actual clinical performance would strengthen generalizability.

Implications for nursing education

The results strongly suggest that **integrating structured skills laboratory sessions** with guided demonstrations, competency checklists, and reflective debriefing should be considered a best practice in RLE design. Faculty development in structured facilitation and debriefing is a necessary parallel investment.

CONCLUSION

This study demonstrates that structured skills laboratory experiences—characterized by guided demonstrations, competency-based checklists, and reflective debriefing—significantly enhance nursing students' clinical preparedness, confidence, and ability to integrate theoretical knowledge into practice. Beyond improving OSCE performance and perceptions of the learning environment, the findings underscore the transformative potential of skills laboratories when intentionally embedded within the nursing curriculum. Rather than serving as ancillary practice spaces, skills laboratories should be leveraged as pedagogical hubs where deliberate practice, structured repetition, and formative feedback bridge the classroom and clinical environment. The qualitative insights affirm that students perceive these experiences not only as tools for technical mastery but also as confidence-building platforms that reduce anxiety and promote professional readiness before patient encounters.

The implications for nursing education are far-reaching. Curriculum developers and faculty should reconceptualize the role of the skills laboratory from a supplementary training venue to a central component of competency-based education. Embedding structured laboratory learning in the curriculum provides a safe, standardized, and equitable environment for students to cultivate psychomotor skills, critical thinking, and clinical judgment prior to engaging with real patients. Moreover, this approach ensures that variations in clinical placement quality do not compromise skill acquisition or student confidence. By systematically integrating structured laboratory RLE,

nursing programs can enhance educational quality, align with international standards of competency-based training, and ultimately contribute to producing graduates who are better prepared to meet the dynamic demands of modern healthcare.

RECOMMENDATIONS

Based on the results of this study, several recommendations are offered to enhance the integration and utilization of skills laboratories in nursing education:

1. **Curriculum Integration:** Nursing programs should institutionalize structured skills laboratory sessions as a core component of Related Learning Experience (RLE). These sessions must be embedded across multiple levels of the curriculum to ensure progressive mastery of psychomotor and clinical reasoning skills.
2. **Standardized Protocols:** The use of competency checklists, guided demonstrations, and structured debriefings should be standardized across laboratory courses. Such protocols can ensure uniformity of training, equitable opportunities for learning, and alignment with international competency-based education standards.
3. **Faculty Development:** Nursing faculty should receive regular training in simulation pedagogy, feedback delivery, and debriefing strategies. Equipping instructors with advanced facilitation skills ensures that laboratory sessions go beyond technical drills to foster reflective practice and clinical judgment.
4. **Policy and Resource Allocation:** Administrators and policymakers must allocate sufficient resources for maintaining state-of-the-art laboratory facilities, ensuring functional equipment, simulation models, and adequate laboratory hours. Sustained investment in infrastructure is critical to achieving learning outcomes.
5. **Future Research:** Further studies are recommended to evaluate long-term outcomes of structured laboratory experiences, including the transfer of skills into clinical practice and eventual patient care quality. Multi-site studies and the use of higher-fidelity simulation technologies may provide more robust evidence for curriculum reform.

By adopting these recommendations, nursing schools can maximize the pedagogical potential of the skills laboratory, strengthen competency-based education, and prepare graduates to enter the clinical setting with confidence, competence, and professional readiness.

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