

Original Article

Simulation-Based Nursing Education in the ASEAN Region: A Scoping Review of Pedagogical Strategies, Barriers, and Frugal Innovations

Esmeraldo De Las Armas IV

Graduate School of Nursing, Philippine Women's University, Philippines School of Nursing, Centro Escolar University - Manila, Philippines

Mark Loniel Aquino

Graduate School of Nursing, Philippine Women's University, Philippines College of Nursing, Pamantasan ng Lungsod ng Maynila, Philippines

Lester Ragadio

Graduate School of Nursing, Philippine Women's University, Philippines San Marcelino District Hospital, Zambales, Philippines

Correspondence: Esmeraldo De Las Armas IV, Ed.D, RN, School of Nursing, Centro Escolar University - Manila, Philippines e-mail: esmeraldoiv.delasarmas@gmail.com

Abstract

Introduction: Simulation-Based Education (SBE) is a cornerstone of experiential nursing learning, yet a "simulation divide" persists in the ASEAN region due to high costs and resource scarcity. This scoping review identifies how institutions navigate these barriers to meet UN Sustainable Development Goals 3 and 4 through sustainable, localized strategies.

Methods: Guided by the Arksey and O'Malley framework and PRISMA-ScR guidelines, a systematic search of PubMed, CINAHL, Scopus, and ScienceDirect was conducted. Using the PCC framework, the review included eight peer-reviewed primary research articles (2015–2026) focused on nursing simulation within the ASEAN context. Data were synthesized using thematic analysis and appraised via JBI tools.

Results: Three themes emerged: (1) the transition toward frugal and virtual innovation, (2) systemic and facilitator-related barriers, and (3) the enhancement of clinical competencies through localized frameworks. Findings demonstrate that "frugal innovations", where using low-cost, improvised materials, effectively build student self-confidence and critical thinking, though adoption is often hindered by faculty workload and internet instability.

Conclusion: The results reveal a "fidelity paradox," suggesting that pedagogical quality and facilitator readiness are more vital for competency development than expensive hardware. The study advocates for a shift from technology-centered to pedagogy-centered education. Recommendations include institutionalizing frugal innovation labs, prioritizing facilitator certification over hardware, and establishing a regional ASEAN simulation network to foster collaborative growth.

Keywords: ASEAN Nursing Education, Frugal Innovation, Simulation-Based Education

Introduction

The pursuit of global health equity and high-quality education, as outlined in the United Nations Sustainable Development Goals (SDGs), specifically SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education), where it demands a nursing workforce that is both technically proficient and ethically grounded (United Nations, 2015). To meet these targets, nursing curricula must evolve to

produce graduates capable of navigating complex clinical environments. Simulation-Based Education (SBE) has proven instrumental in this regard, with research indicating that it significantly enhances nursing students' clinical decision-making skills (Gorucu et al., 2024) and overall professional competencies through rigorous randomized controlled trials (Tong et al., 2024). Furthermore, SBE acts as a transformative tool

for developing ethical reasoning and professional identity, allowing students to rehearse the "caring" role in a controlled setting (Lewis et al., 2016; Philippa et al., 2021).

However, the "gold standard" of SBE, often defined by high-fidelity manikins and advanced technological suites, is frequently inaccessible to nursing schools in the ASEAN region. The high cost of equipment, maintenance, and specialized faculty training creates a "simulation divide." Benchadlia et al. (2023) highlight that while the use of simulation is universally desired, the barriers to implementation in basic nursing education are predominantly resource-driven. In response, many institutions in the developing world have had to pivot toward "frugal innovations", low-cost, high-impact strategies that utilize task trainers, simulated patients, and improvised materials to achieve learning objectives without the financial burden of high-fidelity technology (Ismail et al., 2024).

The pedagogical success of these frugal strategies depends heavily on the human element of simulation, specifically debriefing and psychological safety. Niu et al. (2021) emphasize that the effectiveness of simulation is largely rooted in the debriefing method used, rather than the fidelity of the equipment alone. For students in ASEAN, where cultural nuances and high-stakes testing can increase learner anxiety, establishing psychological safety is paramount. Research suggests that facilitators must actively manage the affective component of learning to accommodate students' emotions and ensure a supportive environment (Madsgaard et al., 2022; Turner et al., 2023). Without this safety, the transition from classroom to clinic remains fraught with stress, regardless of the technology used.

The global landscape of nursing education is undergoing a paradigm shift, transitioning from traditional didactic methods to experiential learning. Simulation-Based Education (SBE) has emerged as a cornerstone of this transition, offering a safe environment to bridge the gap between theoretical knowledge and clinical practice. However, while the effectiveness of SBE is well-established in high-income

countries, its implementation in the developing world (particularly within the ASEAN region) faces unique systemic and financial hurdles. According to Ismail et al. (2024), the uptake of simulation in the developing world is characterized by both significant opportunities for pedagogical growth and daunting challenges related to infrastructure and sustainability. This study focuses on the ASEAN context to map how resource-constrained institutions navigate these barriers. By identifying "frugal innovations" and adaptive strategies used by local educators, this research seeks to provide a localized framework for sustainable nursing education that aligns with regional socioeconomic realities.

The primary goal of this scoping review is to map, synthesize, and analyze the existing evidence on simulation-based education within the ASEAN region, specifically focusing on primary research published between 2015 and 2026. This review aims to identify the specific pedagogical strategies, resource-driven barriers, and frugal innovations utilized by nursing institutions in resource-constrained settings to achieve clinical competencies. Ultimately, this study seeks to provide a localized evidence base that supports SDG 3 and SDG 4 by fostering sustainable, culturally responsive, and economically viable simulation practices across Southeast Asia.

Methodology

Design: This study utilizes a scoping review design to map the existing evidence on simulation-based education in the ASEAN region. The framework is guided by the five-stage process originally proposed by Arksey and O'Malley (2005) and further refined by Levac, Colquhoun, and O'Brien (2010) to enhance methodological rigor. This approach is particularly suited for broad research questions where the goal is to clarify key concepts and identify gaps in a diverse body of literature. The review follows the PRISMA Extension for Scoping Reviews (PRISMA-ScR) to ensure transparent and comprehensive reporting of the results (Tricco et al., 2018).

Eligibility criteria. To ensure a high-quality synthesis of primary evidence, the selection of

literature was guided by the PCC (Population, Concept, Context) framework as recommended by Peters et al. (2020). The target population included undergraduate and graduate nursing students, nursing faculty, or practicing nurses involved in educational settings. The core concept focused on primary research exploring simulation-based pedagogical strategies, barriers to implementation, and the use of frugal or resource-constrained innovations. This was examined specifically within the context of nursing education institutions located in the ASEAN region. Regarding the types of evidence, the review only included peer-reviewed primary research articles—utilizing qualitative, quantitative, or mixed-methods designs—published in the English language between 2015 and 2026. Conversely, articles were excluded if they were secondary reviews (systematic, scoping, or integrative), editorials, or commentaries. Furthermore, grey literature such as theses, dissertations, and non-peer-reviewed reports was strictly excluded to prioritize high-impact, validated data for the final synthesis.

Information sources and search strategy. A comprehensive search was conducted across major electronic databases including PubMed, CINAHL, Scopus, and ScienceDirect. The search strategy was developed using Boolean operators (AND, OR) combining terms for "nursing," "simulation," "resource-constrained," and specific "ASEAN" countries. To ensure the technical quality of the search, the strategy was cross-referenced with the Peer Review of Electronic Search Strategies (PRESS) guideline statement (McGowan et al., 2016), ensuring that search terms accurately captured the intended concepts across different database syntaxes.

Selection process. The selection process followed the iterative approach recommended by Levac et al. (2010). Initially, search results were imported into a reference management software where duplicates were removed. Two independent reviewers screened titles and abstracts based on the eligibility criteria. Discrepancies were resolved through discussion or a third-party arbitrator. In the second stage, full-text articles were retrieved and scrutinized

for final inclusion. The results of the selection process are presented in a PRISMA-ScR flow diagram, documenting the number of records identified, screened, excluded, and ultimately included (Tricco et al., 2018).

Data charting and synthesis. Data from the included studies were extracted using a standardized charting form developed based on JBI recommendations (Peters et al., 2020). Extracted data points included author, year, country, simulation modality, key barriers, and identified frugal innovations. Following data extraction, a thematic analysis was performed using the framework by Braun and Clarke (2006). This involved familiarization with the data, generating initial codes, and identifying overarching themes related to pedagogical strategies and resource adaptations across the ASEAN nursing context.

Critical appraisal. While scoping reviews generally focus on mapping evidence rather than assessing its quality, a critical appraisal was conducted to provide a clearer picture of the evidence's robustness within the ASEAN region (Peters et al., 2020). The methodological quality of the included primary studies was evaluated using the JBI Critical Appraisal Tools, which allowed for the identification of potential biases and the assessment of the strength of the findings related to frugal innovation and barriers in nursing simulation.

Results

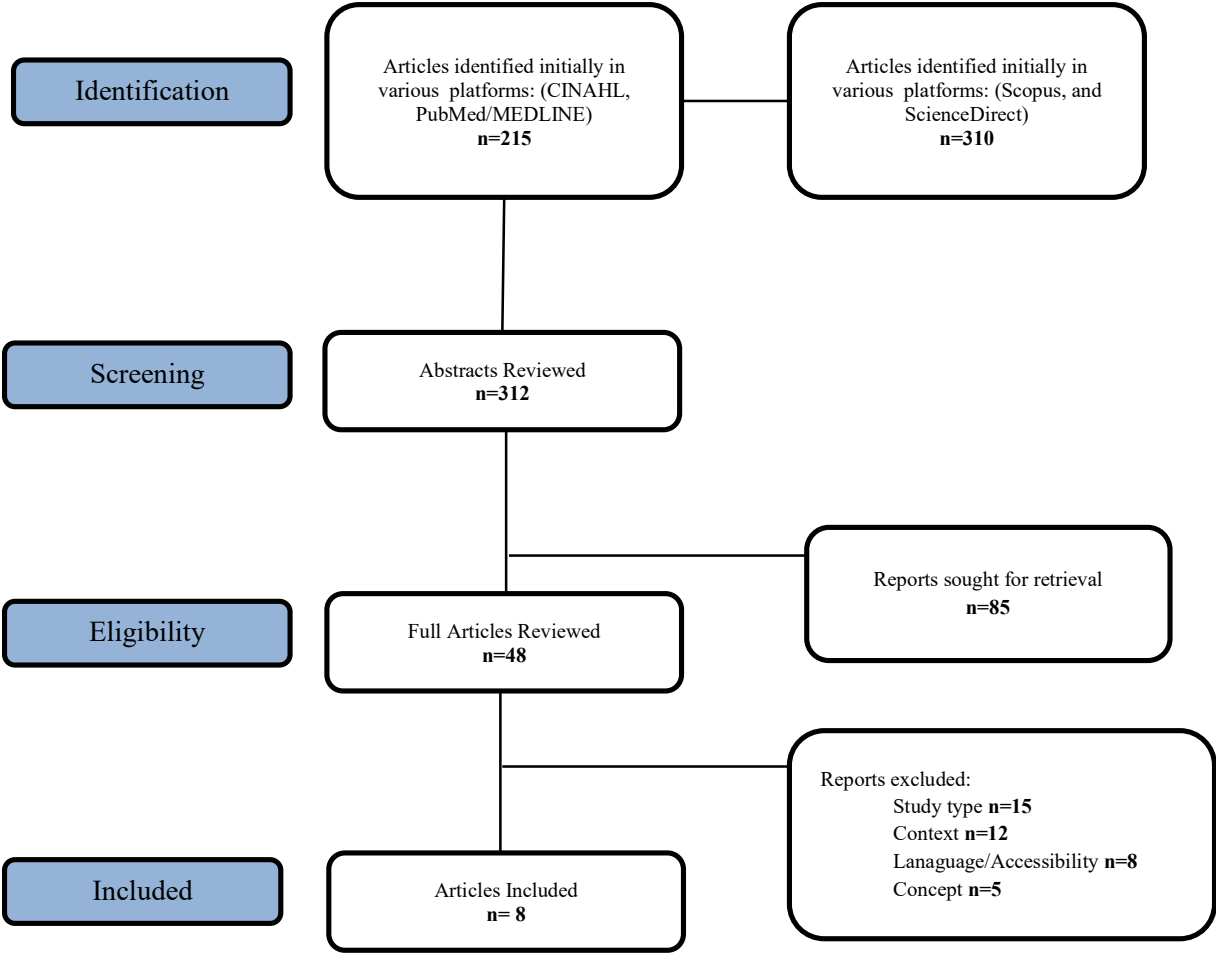
Characteristics of the Studies

The eight primary studies included in this review represent a diverse geographical cross-section of the ASEAN region, spanning the Philippines, Indonesia, Vietnam, and Malaysia, with one study involving a Thai-Indonesian collaboration. The publication dates range from 2022 to 2025, reflecting a contemporary surge in simulation research. Methodologically, the evidence base is varied: four studies utilized quantitative approaches, including structural equation modeling (Rebueno et al., 2024) and quasi-experimental designs (Emaliyawati et al., 2025; Oanh et al., 2024; Gaspar & Banayat, 2024). Qualitative perspectives were captured through content analysis and descriptive phenomenology (Berdida et al., 2022; Israel et al., 2025; Mariz, 2023), while one study

employed a mixed-methods approach to explore virtual platforms (Manik et al., 2022). The participants primarily consisted of undergraduate nursing students, though two

studies focused specifically on the perspectives and adoption intentions of nurse educators (Mariz, 2023; Rebueno et al., 2024).

Figure 1. PRISMA-ScR Flow of Information Through the Review



Thematic Synthesis: The thematic synthesis of the included literature revealed three overarching themes: the transition toward frugal and virtual innovation, systemic and facilitator-related barriers to adoption, and the enhancement of clinical competencies through localized simulation frameworks.

Frugal Innovation and Virtual Adaptation: A prominent theme across the literature is the creative adaptation of simulation modalities in response to resource constraints and the COVID-19 pandemic. Berdida et al. (2022) documented

"frugal innovation" among Filipino nursing students who developed low-cost simulators—such as using household items to mimic medical equipment—demonstrating that psychomotor skills can be practiced outside of high-tech laboratories. Similarly, Manik et al. (2022) explored the shift toward virtual simulation in Indonesia, noting that while it provided a necessary alternative during lockdowns, students faced significant hurdles regarding internet stability and platform accessibility. These studies highlight a regional trend where "fidelity" is often

redefined through the lens of availability and creative improvisation.

Systemic Barriers and Facilitator Readiness: Despite the recognized benefits of simulation, significant barriers persist. Mariz (2023) identified that Malaysian nurse educators face challenges in integrating high-fidelity simulation due to high costs, time constraints, and a lack of technical expertise. This is further elucidated by Rebuena et al. (2024), whose structural equation model identified that organizational support and facilitator-related factors are critical predictors of an institution's intention to adopt simulation. Facilitators often feel overwhelmed by the transition from traditional lecturing to simulation debriefing, suggesting that the "simulation divide" in ASEAN is as much about human capital as it is about financial resources.

Impact on Competency and Clinical Outcomes:

The final theme emphasizes the positive correlation between simulation and nursing student outcomes. In Vietnam, Oanh et al. (2024) demonstrated that simulation-based training significantly improved problem-solving, critical thinking, and self-efficacy. This is echoed by Gaspar and Banayat (2024) and Israel et al. (2025), who found that even with high-fidelity setups, the primary value for Filipino students was the boost in self-confidence and the ability to manage critically ill patients in a safe environment. Furthermore, Emaliyawati et al. (2025) showed that specialized simulation frameworks, such as integrated experiential learning for disaster nursing, effectively enhance specific clinical learning outcomes that are highly relevant to the ASEAN geographic context.

Table 1. Characteristics of the Studies

Authors, Year	Design / Setting	Population / Sample	Focus of the Study	Key Findings	Critical Appraisal of the Article
Berdida et al. (2022)	Qualitative (Content Analysis) / Philippines	158 YouTube videos by nursing students	Use of low-cost, improvised simulators during the pandemic.	Students demonstrated high creativity using household items to practice psychomotor skills; frugal innovation bypassed lab closures.	High: Unique data source; clear methodology; relevant to resource-limited contexts.
Emaliyawati et al. (2025)	Quasi-Experimental / Indonesia & Thailand	91 Undergraduate nursing students	Integrated experiential simulation in disaster nursing.	Simulation significantly improved disaster response competencies and learning outcomes compared to traditional methods.	High: Rigorous quasi-exp design; clear intervention protocol; regional relevance.
Gaspar & Banayat (2024)	Quantitative (Descriptive) / Philippines	124 Level 4 Nursing students	Satisfaction and self-confidence in high-fidelity simulation (HFS).	High satisfaction levels and significant increase in self-confidence when managing critically ill patient scenarios.	Moderate/High: Specific to critical care; strong statistical validity; localized to PH.
Israel et al. (2025)	Qualitative (Phenomenology) / Philippines	15 Nursing students	Student perspectives on the transition to simulation-based learning.	Students value the safe "error-permissible" environment; simulation reduces anxiety before actual clinical rotations.	High: Deep thematic insights into the "affective" domain of learning in ASEAN students.
Manik et al. (2022)	Mixed-Methods / Indonesia	108 Nursing students	Perspectives on virtual simulation learning.	Virtual simulation is a viable alternative but hindered by internet instability and lack of face-to-face debriefing.	Moderate: Highlights the "Digital Divide" as a major barrier in the region.
Mariz (2023)	Qualitative (Descriptive) / Malaysia	10 Nurse educators	Educators' perspectives on the use of HFS in clinical teaching.	Barriers include high maintenance costs, heavy faculty workload, and the need for specialized technical training.	High: Directly addresses institutional barriers and the "Facilitator Gap."

Oanh et al. (2024)	Quasi-Experimental / Vietnam	84 Nursing students	Impact of SBE on problem-solving, critical thinking, and self-efficacy.	Post-test scores showed significant gains in all three domains, confirming SBE's efficacy in the Vietnamese context.	High: Strong pre/post-test metrics; supports the pedagogical shift in Vietnam.
Rebueno et al. (2024)	Quantitative (SEM) / Philippines	207 Nurse educators	Factors influencing the intention to adopt simulation.	Organizational support and facilitator self-efficacy are the strongest predictors of simulation adoption in nursing schools.	High: Sophisticated SEM analysis; provides a roadmap for institutional policy change.

Table 2. Themes, Descriptions, and Key Supporting Studies

Theme	Description	Key supporting studies
The Transition Toward Frugal and Virtual Innovation	The creative shift toward "frugal" ingenuity, utilizing low-cost, improvised task-trainers and virtual platforms to bridge the resource gap. This theme highlights how institutions bypass infrastructure deficits through localized adaptations and digital alternatives.	Berdida et al. (2022); Manik et al. (2022)
Systemic and Facilitator-Related Barriers to Adoption	The institutional and human-resource hurdles that hinder simulation uptake, including high maintenance costs, lack of technical expertise among faculty, and the critical influence of organizational support on adoption intention.	Mariz (2023); Rebueno et al. (2024)
Enhancement of Clinical Competencies through Localized Frameworks	The measurable impact of simulation on students' "soft" and "hard" skills. This encompasses gains in critical thinking, self-efficacy, and disaster preparedness, as well as the development of professional confidence within a safe learning environment.	Emaliyawati et al. (2025); Gaspar & Banayat (2024); Israel et al. (2025); Oanh et al. (2024)

Discussion

The synthesis of primary research from the ASEAN region reveals a nursing education landscape that is both resilient and adaptive, yet significantly challenged by systemic and infrastructural constraints. When interpreting the regional findings against global benchmarks, a compelling narrative emerges: while the "gold standard" of high-fidelity simulation (HFS) remains a worldwide aspirational goal, the ASEAN region is actively carving out a niche for sustainable, "frugal" alternatives that align with international competency standards while remaining tailored to local socioeconomic realities.

A central finding in the included ASEAN studies is that simulation (regardless of the level of technology) significantly boosts clinical judgment and self-efficacy. This local evidence is strongly supported by the global meta-analysis of Xu et al. (2021), which confirms that simulation-based education (SBE) fundamentally improves

performance assessment and knowledge retention across diverse nursing populations. Furthermore, the systematic review by Ghoul et al. (2025) underscores that HFS is particularly potent in developing clinical competencies in undergraduate students. However, the ASEAN experience suggests a "fidelity paradox." While multicenter randomized controlled trials in high-income settings, such as the study by Haddeland et al. (2021), emphasize the technical superiority of HFS, the ASEAN primary research indicates that essential learning outcomes are being met through "frugal innovations." This suggests that in resource-constrained settings, the pedagogical process (specifically the quality of the scenario and the student's engagement) may be more critical than the mechanical complexity of the manikin.

The shift toward virtual and technology-supported simulation identified in Indonesia and the Philippines reflects a broader global movement. Stenseth et al. (2025) highlight that technology-

supported SBE is uniquely positioned to enhance critical thinking, a core requirement for modern nursing practice. However, a significant "digital divide" persists. While students in high-resource systems might experience seamless technology integration, regional findings report internet instability and platform accessibility as major barriers. This suggests that for technology to truly serve SDG 4 (Quality Education) in Southeast Asia, infrastructural support must accompany the pedagogical shift. When high-tech solutions fail due to connectivity, the reliance on "simulated patients" becomes a vital fallback. As noted by MacLean et al. (2017), simulated patients are an exceptionally effective and relatively low-cost modality for developing communication skills—a finding that justifies the continued use of standardized patients in ASEAN as a high-value, sustainable strategy.

Furthermore, the regional focus on the human element (specifically the facilitator's role and the affective state of the student) is echoed in international literature. Tran et al. (2026) explored the experiences of international nursing students, finding that cultural and linguistic backgrounds significantly influence how students perceive and react to simulation. In the ASEAN context, where hierarchical education systems can sometimes hinder student-teacher dialogue, the facilitator's ability to create a safe space for error is paramount. This connects deeply to the work of Lamlile et al. (2020), who discuss the importance of role-modeling and the "caring" identity in nursing. Simulation in ASEAN serves as a stage where students do not just practice tasks; they perform their professional identity. By aligning with global evidence that simulation improves critical thinking and clinical skills, ASEAN nursing schools can justify continued investment in SBE. However, as this review suggests, that investment must prioritize faculty development and frugal modalities to ensure nursing education remains inclusive, resilient, and directly contributory to SDG 3.

Implications for Practice

The implications of this scoping review suggest a transformative shift in nursing education, moving away from a "technology-centered" model toward one that is "pedagogy-centered." By demonstrating that clinical competencies can be

achieved through frugal innovations and low-cost simulators, the study deconstructs the myth that high-fidelity equipment is the only path to educational quality. This has profound economic implications for global health equity, as it provides a scalable blueprint for achieving SDG 3 and SDG 4 in resource-limited settings. It implies that institutional investment should shift from expensive hardware to human capital, specifically prioritizing faculty development in structured debriefing and psychological safety.

Furthermore, the study highlights the necessity of curriculum resilience; the successful use of virtual and home-based simulation kits during the pandemic suggests these should be integrated as permanent components of a flexible nursing curriculum rather than mere emergency backups. Ultimately, these findings encourage "reverse innovation," where cost-effective, high-impact strategies developed in the ASEAN region can serve as models for healthcare systems globally that are currently struggling with rising educational costs.

Limitations: Despite the rigorous application of the PRISMA-ScR and PCC frameworks, this scoping review has several limitations. First, by excluding grey literature, such as unpublished theses and institutional reports, the review may have overlooked innovative, locally developed simulation strategies that have not yet reached peer-reviewed publication. Second, the exclusion of non-English articles may have resulted in a language bias, potentially omitting significant primary research published in national languages such as Thai, Vietnamese, or Bahasa Indonesia.

Third, the "High Impact" criterion for journal selection may have favored better-funded institutions, potentially underrepresenting the most extreme cases of resource-constrained "frugal innovation" in smaller or rural nursing colleges. Fourth, the geographic imbalance within the included studies (predominantly featuring the Philippines) limits the generalizability of the findings to the entire ASEAN region, particularly in nations like Laos, Myanmar, and Cambodia where primary research on SBE remains scarce. Finally, as a scoping review, this study did not involve a formal meta-analysis of clinical outcomes; therefore, while it maps pedagogical trends and barriers, it cannot definitively conclude which specific frugal innovation is the most

statistically effective for competency development.

Conclusion: This scoping review highlights a significant shift toward pedagogical resilience within the ASEAN nursing community. By embracing frugal innovations and adaptive strategies, regional institutions are demonstrating that the lack of high-fidelity technology does not equate to a lack of educational quality. These findings shift the global narrative from one of resource scarcity to one of creative ingenuity, proving that effective clinical training is achievable through thoughtful methodology and localized solutions. Ultimately, the evidence suggests that the future of nursing simulation in the region lies not in the complexity of the machines, but in the empowerment of the educators and the strategic use of accessible tools to meet global health standards.

Recommendations

To bridge the "simulation divide" and foster a sustainable educational environment in Southeast Asia, the following practical actions are recommended:

- ***Institutionalize "Frugal Innovation" Labs,*** where Nursing schools should move beyond viewing low-cost simulators as temporary fixes. Curriculums should officially integrate "frugal labs" where students and faculty collaboratively design and validate task trainers using locally sourced materials. This ensures that psychomotor training continues even when high-tech equipment is undergoing maintenance or is financially out of reach.
- ***Prioritize Facilitator Certification over Hardware Acquisition,*** instead of allocating entire budgets to high-fidelity manikins, institutions should invest in "Train the Trainer" programs. Professional development should focus specifically on structured debriefing techniques and the management of psychological safety, as the educator's skill is the primary driver of learning, regardless of the technology used.
- ***Implement "Low-Bandwidth" Virtual Simulation,*** for regions with unstable internet connectivity, developers and educators

should prioritize the use of asynchronous, offline-capable virtual simulation platforms. This ensures that students in rural or underserved areas can access high-quality scenario-based learning without the need for high-speed fiber optics.

- ***Establish a Regional ASEAN Simulation Network,*** a collaborative platform should be created for ASEAN nursing schools to share "blueprints" for frugal innovations and localized simulation scenarios. This prevents the duplication of effort and allows institutions in countries with established programs, like the Philippines and Malaysia, to mentor emerging programs in Cambodia, Laos, and Myanmar.
- ***Standardize the Use of Simulated Patients (SPs),*** where Nursing schools formalize programs that train community volunteers or senior students as standardized patients. This remains one of the most cost-effective and high-impact methods for teaching communication and "caring" identity, which are central to nursing practice.

Disclosure of Use of Generative AI: To ensure the highest level of clarity and readability, AI was utilized as an assistive tool for organizing ideas and refining the grammar of this article. The content, core ideas and insights are entirely the author.

References

- Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32. <https://doi.org/10.1080/1364557032000119616>
- Benchadlia, F., Rabia, Q., & Abderrahim, K. (2023). Simulation in Basic Nursing Student Education: Uses and Barriers. *The Open Nursing Journal*, 17(1). <https://doi.org/10.2174/18744346-v17-230717-2023-198>
- Berdida, D. J. E., Elero, F. S. L., Donato, M. F. T., Dungo, Ma. K. S., Dunque, N. I. O., Dy, K. J. E., Elarmo, R. A. G. F., Espineli, J. M. B., & Espineli, V. J. G. (2022). Filipino nursing students' use of low-cost simulators during the COVID-19 pandemic: A summative content analysis of youtube videos. *Teaching and*

- Learning in Nursing, 18(1).
<https://doi.org/10.1016/j.teln.2022.08.003>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
<https://doi.org/10.1191/1478088706qp063oa>
- Emaliyawati, E., Ibrahim, K., Trisyani, Y., & Songwathana, P. (2025). The Effect of Integrated Simulation Experiential Learning Disaster Nursing for Enhancing Learning Outcomes Among Undergraduate Nursing Students: A Quasi-Experimental Study. *Advances in medical education and practice*, 16, 311–321.
<https://doi.org/10.2147/AMEP.S489163>
- Gaspar, A., & Banayat, A. (2024). Undergraduate Student Nurses' Satisfaction, Self-confidence, and Perception of High-fidelity Simulation-based Learning on Critically-ill Patients. *Acta Medica Philippina*, 58(12).
<https://doi.org/10.47895/amp.v58i12.10240>
- Ghoul, I., Abdullah, A., Hodrob, M., Awwad, F., Jaber, N., Hodrob, A., Nazzal, B., Malak, M. Z., Hayek, M., Said, N., Qadous, S., Asia, A., & Qaysi, W. (2025). The effect of high-fidelity simulation on clinical competencies in undergraduate nursing students: a systematic review of randomized controlled trials.
<https://doi.org/10.21203/rs.3.rs-7234638/v1>
- Gorucu Y, Turk G, Karacam Z. (2024). The Effect of simulation-based Learning on Nursing students' Clinical decision-making skills: Systematic Review and meta-analysis. *Nurse Education Today*, 140, 106270–106270.
<https://doi.org/10.1016/j.nedt.2024.106270>
- Haddeland, K., Slettebø, Å., Svensson, E., Tosterud, R. B., Wangensteen, S., & Fossum, M. (2021). The Effects of Using High-Fidelity Simulation in Undergraduate Nursing Education: A Multicenter Randomized Controlled Trial with a Process Evaluation. *International Journal of Educational Research*, 109, 101813.
<https://doi.org/10.1016/j.ijer.2021.101813>
- Ismail, F. W., Ajani, K., Syed Mujtaba Baqir, Nadeem, A., Qureshi, R., & Pammla Petrucka. (2024). Challenges and opportunities in the uptake of simulation in healthcare education in the developing world: a scoping review. *MedEdPublish*, 14, 38–38.
<https://doi.org/10.12688/mep.20271.1>
- Israel, M. G., Gatdula, L. T., Alvin, H., Casabona, A., Miranda, M. D., Fidel, L. V., Cruz, J., & Mabasa, C. R. (2025). Simulation-Based Learning in Nursing Education: Perspectives of Student Nurses in the Philippines. *World Journal of Nursing Research*, 120–125.
<https://www.scipublications.com/journal/index.php/wjnr/article/view/6196>
- Lamlile, M. T., Charlené, D., & Irene, K. (2020). South African Student nurses' Experiences of Professional nurses' Role-Modelling of Caring. *Journal of Professional Nursing*, 37(1).
<https://doi.org/10.1016/j.profnurs.2020.10.010>
- Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5(1), 69.
<https://doi.org/10.1186/1748-5908-5-69>
- Lewis, G., McCullough, M., Maxwell, A. P., & Gormley, G. J. (2016). Ethical reasoning through simulation: a phenomenological analysis of student experience. *Advances in Simulation*, 1(1). <https://doi.org/10.1186/s41077-016-0027-9>
- MacLean, S., Kelly, M., Geddes, F., & Della, P. (2017). Use of simulated patients to develop communication skills in nursing education: An integrative review. *Nurse Education Today*, 48(48), 90–98.
<https://doi.org/10.1016/j.nedt.2016.09.018>
- Madsgaard, A., Røykenes, K., Smith-Strøm, H., & Kvernenes, M. (2022). The affective component of learning in simulation-based education – facilitators' strategies to establish psychological safety and accommodate nursing students' emotions. *BMC Nursing*, 21(1).
<https://doi.org/10.1186/s12912-022-00869-3>
- Manik, M., Gultom, E., Sibuea, R., & Pailak, H. (2022). Virtual Simulation Learning from Indonesian Nursing Students' Perspectives. *Open Access Macedonian Journal of Medical Sciences*, 10(G), 112–117.
<https://doi.org/10.3889/oamjms.2022.8239>
- Mariz, J. (2023). Use of high-fidelity simulation in clinical teaching: Nurse educators' perspective. *The Malaysian Journal of Nursing*, 14(04), 73–82.
<https://doi.org/10.31674/mjn.2023.v14i04.008>
- McGowan, J., Sampson, M., Salzwedel, D. M., Cogo, E., Foerster, V., & Lefebvre, C. (2016). PRESS peer review of electronic search strategies: 2015 guideline statement. *Journal of Clinical Epidemiology*, 75, 40–46.
<https://doi.org/10.1016/j.jclinepi.2016.01.021>
- Niu, Y., Liu, T., Li, K., Sun, M., Sun, Y., Wang, X., & Yang, X. (2021). Effectiveness of simulation debriefing methods in nursing education: A systematic review and meta-analysis. *Nurse Education Today*, 107, 105113.
<https://doi.org/10.1016/j.nedt.2021.105113>
- Oanh, T. T. H., Thuy, L. T., & Huyen, N. T. T. (2024). The effect of simulation-based training on problem-solving skills, critical thinking skills, and self-efficacy among nursing students in

- Vietnam: a before-and-after study. *Journal of Educational Evaluation for Health Professions*, 21, 24. <https://doi.org/10.3352/jeehp.2024.21.24>
- Peters, M. D. J., Godfrey, C. M., McInerney, P., Munn, Z., Tricco, A. C., & Khalil, H. (2020). Chapter 11: Scoping reviews. In *JBIMES-20-12*. JBI. <https://doi.org/10.46658/JBIMES-20-12>
- Philippa, R., Ann, H., Jacqueline, M., & Nicola, A. (2021). Professional identity in nursing: A mixed method research study. *Nurse Education in Practice*, 52(1), 103039. <https://doi.org/10.1016/j.nepr.2021.103039>
- Rebueno, Ma. C. D. R., Vitug, P. Z., & Macindo, J. R. B. (2024). Organizational- and facilitator-related factors of intention to adopt simulation among Filipino nurse educators: a structural equation modeling. *Teaching and Learning in Nursing*, 19(4), e678–e686. <https://doi.org/10.1016/j.teln.2024.06.006>
- Stenseth, H. V., Steindal, S. A., Solberg, M. T., Ølnes, M. A., Sørensen, A. L., Strandell-Laine, C., Olaussen, C., Farsjø Aure, C., Pedersen, I., Zlamal, J., Gue Martini, J., Bresolin, P., Linnerud, S. C. W., & Nes, A. A. G. (2025). Simulation-Based Learning Supported by Technology to Enhance Critical Thinking in Nursing Students: Scoping Review. *Journal of Medical Internet Research*, 27, e58744. <https://doi.org/10.2196/58744>
- Tong, L. K., Li, Y. Y., Au, M. L., Ng, W. I., Wang, S. C., Liu, Y., Shen, Y., Zhong, L., & Qiu, X. (2024). The effects of simulation-based education on undergraduate nursing students' competences: a multicenter randomized controlled trial. *BMC Nursing*, 23(1), 400. <https://doi.org/10.1186/s12912-024-02069-7>
- Tran, T. H., Yahalom, S., Brand, G., & Bonnamy, J. (2026). Experiences of international nursing students in simulation-based education: A descriptive qualitative study. *Clinical Simulation in Nursing*, 110, 101837. <https://doi.org/10.1016/j.ecns.2025.101837>
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., ... Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169(7), 467–473. <https://doi.org/10.7326/M18-0850>
- Turner, S., Harder, N., Martin, D., & Gillman, L. (2023). Psychological safety in simulation: Perspectives of nursing students and faculty. *Nurse Education Today*, 122, 105712. <https://doi.org/10.1016/j.nedt.2023.105712>
- United Nations. (2015). The 17 sustainable development goals. United Nations. <https://sdgs.un.org/goals>
- Xu, Y., Xu, Y., Wang, Q., Du, S., Jiang, X., & Xu, G. (2021). Impact of simulation-based education on the performance assessment, knowledge retention and mentality of nursing students: A systematic reviews and meta-analysis. <https://doi.org/10.21203/rs.3.rs-464093/v1>