International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Online and Blended Learning and its Effects in Asian Nursing Education

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ABSTRACT

Nursing education has embraced innovative methodologies, including web-based, blended, and simulation-based learning strategies. These methods have been designed to enhance critical thinking, clinical skills, and self-efficacy among students. This study aims to evaluate the effectiveness of these strategies in nursing education. A systematic review of peer-reviewed articles published between 2019 and 2024 was conducted. The studies included in this review focused on the use of web-based, blended, and simulation-based learning in nursing education. A total of 13 studies were selected based on the inclusion criteria, which emphasized innovative teaching strategies and their effects on student performance and engagement. The studies highlighted the benefits of blended learning, which integrates online and face-to-face instruction, as it improves students' problem-solving and critical thinking skills. Web-based learning was found to be effective in improving knowledge retention and clinical preparedness, while simulation-based learning significantly boosted students' confidence and reduced anxiety in high-stress environments such as maternity clinical practice. These innovative methods foster active learning and promote real-time feedback, enhancing student engagement and preparedness for clinical practice. Despite the promising results, the studies also revealed several limitations, including small sample sizes and reliance on self-reported data. Future research should focus on longitudinal studies with larger sample sizes to better understand the long-term effects of these teaching strategies on clinical competence and patient outcomes. The integration of blended, web-based, and simulation-based learning strategies significantly improves nursing students' academic performance, self-efficacy, and clinical skills. However, more robust research is needed to further establish their effectiveness in diverse educational and clinical settings.

Keywords: Nursing education, Online learning, Blended learning, Web-based education, Simulation-based learning

INTRODUCTION

Nursing education has experienced a significant transformation in recent years, driven by advancements in technology and the evolving needs of healthcare systems. Innovative teaching methods such as web-based, blended, and simulation-based learning have been introduced to enhance critical thinking, clinical skills, and self-efficacy among nursing students (Zaybak et al., 2023; Li et al., 2023). Traditional teaching methods, while foundational, may no longer suffice to equip students with the skills necessary to navigate the complexities of modern healthcare environments. As healthcare continues to advance rapidly, nursing students must be adequately prepared for both the theoretical and practical demands of clinical practice (Su et al., 2023).

The researchers of this study identified a significant gap in the literature concerning the long-term effectiveness of these innovative learning strategies in enhancing clinical competency. While several studies have shown the short-term benefits of web-based, blended, and simulation-based learning (Meng et al., 2022; Yeh & Yang, 2024), there is limited research exploring their sustained impact on nursing students' readiness for clinical practice. Additionally, much of the available research focuses on Western contexts, with limited attention given to how these methods are being implemented and adapted in Asian nursing education. This represents a critical gap, as cultural, educational, and healthcare system differences may influence the effectiveness of these methods (Huang et al., 2021).

This study is timely, as the COVID-19 pandemic has accelerated the adoption of online and blended learning in nursing education globally. With the growing reliance on digital platforms for remote learning, it is essential to evaluate how well these methods prepare nursing students for clinical practice in real-world settings (Kang & Kim, 2021). The researchers of this study aim to contribute to this body of knowledge by systematically reviewing the impact of web-based, blended, and simulation-based learning strategies on the academic performance, clinical skills, and self-efficacy of nursing students in Asia.

By addressing the observed gaps in the current literature and investigating the effectiveness of these methods in the Asian context, this study seeks to provide valuable insights for educators and policymakers. The researchers propose that a more comprehensive understanding of the effectiveness of these strategies could lead to the development of more targeted and culturally relevant educational programs that enhance nursing students' clinical competencies.

Research Questions

The researchers of this study aim to explore the impact of web-based, blended, and simulation-based learning strategies on the educational outcomes of nursing students in Asia. Specifically, the study seeks to answer the following questions:

1. What are the impacts of blended, web-based, and simulation-based learning on the learning outcomes and readiness for clinical practice among nursing students?

METHODOLOGY

A. Process of Manuscript Selection

The manuscript selection process involved identifying, screening, and including studies that aligned with the systematic review's objective. A comprehensive search was conducted using major databases, and the inclusion criteria were designed based on the PICOS framework (Population, Intervention, Comparison, Outcome, Study Design). The search yielded a total of 3,245 articles, of which 13 were included in the final review after several rounds of screening and filtering based on relevance, inclusion/exclusion criteria, and quality assessments.

B. Reporting Standards

The systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, ensuring that the process was consistent, transparent, and replicable. This included a clear reporting of the search strategy, selection criteria, data collection process, and the synthesis of results. Additionally, the review adhered to PRISMA's requirement of constructing a flowchart for tracking the selection of studies through different phases (identification, screening, eligibility, and inclusion).

C. Eligibility Criteria

The PICOS framework was chosen as the basis for the inclusion criteria. Studies were included in the rev-

iew if they involved English language students using both traditional and blended learning approaches. A detailed explanation of the inclusion and exclusion criteria is provided in the following table.

Criterion	Inclusion	Exclusion
Type of Course	Studies comparing online or blended, and traditional learning	Studies without comparison
Publication Date	2019-2024 (5 years)	Published before 2018
Publication Language	English	All other language studies
Publication Type	Original Quantitative, Qualitative, Mixed Method, Meta-analysis, Systematic Reviews, Free Full text.	Conference papers, commentaries, editorials
Study Population	Studies conducted to nursing students only	Non nursing students

Table 1. Inclusion and Exclusion Criteria

D. Information Sources

The databases used for this systematic review were PubMed, ProQuest, and EBSCOhost, as they provide extensive coverage of nursing and healthcare-related literature. To ensure accuracy and completeness, no date restrictions were initially applied, though later refinement was done to include only studies from 2019 onwards.

E. Search Strategy

A systematic and highly detailed search strategy was developed using Boolean and proximity operators. The search strings combined relevant keywords with Boolean operators like AND, OR, and NOT to refine the results. Proximity operators such as NEAR/ and ADJ/ were used to limit the occurrence of keywords in close proximity, ensuring higher relevance. Search strings were used such as: "blended learning" AND "nursing education" AND (outcome OR performance OR skill*)**, ("web-based learning" OR "online learning") AND "nursing" NEAR/3 "education", and "simulation-based learning" AND "critical thinking" AND "nursing" NOT "medicine"

Searches were tailored to each database, applying relevant filters like language (English) and publication date (2019-2024). Additionally, manual searches were conducted on selected articles' reference lists to ensure all pertinent studies were included.

F. Selection Process

The selection process involved two screening phases. In the primary screening, 3,245 article titles and abstracts were evaluated for relevance based on predefined inclusion/exclusion criteria. Articles irrelevant to nursing education or focused solely on traditional methods without comparison were excluded. This resulted in 2,524 articles being discarded. In the secondary screening, 721 full-text articles were reviewed in detail. A total of 13 studies (Table 2.0) were ultimately selected based on their relevance, quality, and adherence to the PICOS framework. This process followed the PRISMA guidelines for transparency.

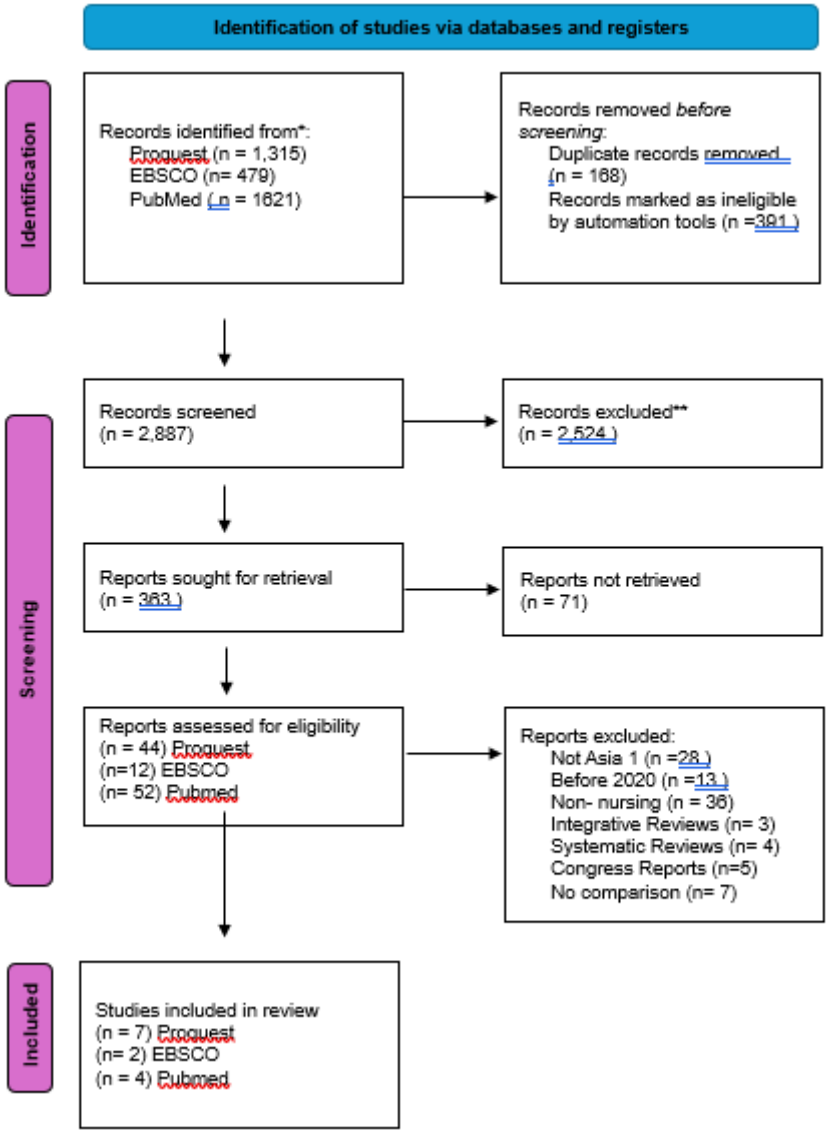

Figure 1 – PRISMA Workflow Diagram

G. Data Synthesis Process

A narrative synthesis was employed to integrate and summarize the findings of the included studies. Given the heterogeneity in study designs, interventions, and outcome measures, it was deemed inappropriate to conduct a meta-analysis. Instead, a qualitative synthesis was used to compare how different educational strategies—blended learning, web-based learning, and simulation-based learning—impacted nursing education outcomes. The synthesis highlighted common themes across studies, such as the effectiveness of blended learning in fostering critical thinking and the role of simulation-based learning in improving clinical skills.

Author	Title	Year	Country	Design	Sample	Major Variables	Intervention	Modality	Control
1. **Zaybak Ayten, PhD, RN; Gunay Ismailoglu, Elif, PhD, RN; Ozdemir Handan, PhD, RN; Ahmet Erol, PhD, RN; Ece Kurt, MSc RN**	**The Effect of Web-Based Education on Teaching the Nursing Process**	2023	Turkey	Quasi-Experimental (Pretest-Posttest)	90 nursing students (46 in control, 44 in intervention)	Nursing Process Knowledge, Satisfaction, Nursing Process Implementation Skills	Web-Based Education	Online education combined with traditional classroom learning	Traditional classroom education alone
2. Agamata, K. M. A., Amansec, A. R. T., Baliclic, I. M. A., Batucan, R. J. D., Campos, K. A. G., Casimo, A. T., Celebrados, K. A. R., Corado, M. J. D., & Quijencio, W. D.	**The Intramuscular Injection Skills of Level II and Level III Nursing Students During Face-to-Face Learning and Online Learning**	2021	Philippines	Quantitative, descriptive-comparative	303 level II (105) and level III (198) nursing students	Intramuscular Injection Competence, Skills and Knowledge; Learning Modality	Face-to-Face Learning; Online Learning	Face-to-Face Learning; Online Learning	Face-to-Face Learning
3. Ching-Hsueh Yeh	**Comparing the effect**	2024	Taiwan	Quasi-experimental with	134 junior nursing students	Anxiety, Self-efficacy in maternal	ASA-based education	Pre-post design,	Traditional simulation-

Yang, Ya-Ping	**of assessment-simulation-animation-based against traditional education on nursing students' anxiety and self-efficacy in maternity clinical practicum**			control group		clinical practicum	program (animated videos and colorful pamphlets) vs. traditional education	Online platform, Videos, Pamphlets	based videos with black and white text-based pamphlets
4. Chin-Lan, Yang; Ching-Yi, Chang; Hsiu-Ju Jen.	**Facilitating undergraduate students' problem-solving and critical thinking competence**	2023	Taiwan	Quasi-experimental with control group	42 nursing students (2 classes)	Learning achievements, Problem-solving skills, Critical thinking	Online escape room (OGBER) vs. traditional class	Online game-based escape room, Traditional class	Traditional class with online learning (no escape room)

	via online escape room learning								
5. Li, Ke; Xu, Lanlan; Sun, Li; Xiao, Juan; Lingxuan Tao	**The effect of blended task-oriented flipped classroom on the core competencies of undergraduate nursing students: a quasi-experimental study**	2023	China	Pre- and post-test quasi-experimental	303 nursing students (152 experimental, 151 control)	Self-directed learning, Problem-solving, Critical thinking	Blended task-oriented flipped classroom (TFC) vs. traditional lectures	Blended TFC, Traditional lectures	Traditional lectures
6. Li, Yan Ran; Zong Hao Zhang; Li, Wen; Wang, Pan; Shu Wen Li	**Effectiveness and learning experience from undergraduate nursing**	2023	China	Historical control, two-armed, mixed, quasi-experimental	638 nursing undergraduates (334 blended learning, 304 traditional)	Skill performance, Learning engagement	Blended learning vs. traditional learning	Blended learning course, Traditional learning course	Traditional learning course

	students in surgical nursing skills course: a quasi-experimental study about blended learning								
7. Su, Xinyang; Huaxiu Ning; Zhang, Fang; Liu, Li; Zhang, Xiaoling; et al.	**Application of flipped classroom based on CDIO concept combined with mini-CEX evaluation model in the clinical teaching of orthopedic nursing**	2023	China	Experimental (Control vs. Intervention)	50 undergraduate nursing students in control group; 50 in intervention group	Clinical practice ability, critical thinking ability, autonomous learning ability, theoretical and operational performance, clinical teaching quality	Flipped classroom teaching mode based on CDIO (conceive–design–implement–operate) concept	CDIO-based flipped classroom	Traditional teaching mode
8. Meng, Xiang-hong; Xu,	**The effectiveness of**	2022	China	Experimental Study	160 nursing students in	**Academic Performance**;	E-learning, Peer	Hybrid	Textbook-based

Xiao-yong; Chen, Hui-lin; Zhang, Lin	**combining e-learning, peer teaching, and flipped classroom for delivering a physiology laboratory course to nursing students**				physiology lab course	**Procedural Skill Proficiency; Student Perception**	Teaching, Flipped Classroom		Preview
9. Hee Young Kang; Kim, Hae Ran	**Impact of blended learning on learning outcomes in the public healthcare education course: a review of flipped classroom**	2021	South Korea	Experimental	First year nursing students Blended Learning Group: 80 Traditional Lecture-Based Group: 90	**Knowledge, Problem-solving ability, Learning satisfaction**	earning (flipped classroom with team-based learning)	Pre-class, in-class, post-class learning elements	Traditional lecture-based classroom

	with team-based learning								
10. Subhashini N. Govindan, Harvinder K. D. Singh, Lee W. Ling, and Mahendran Sekar	**Effect of blended self-directed learning on nursing students: Quasi-experimental approach**	2023 Jul 29	Universiti Kuala Lumpur (Royal College of Medicine Perak).	quasi-experimental approach	A comparison was carried out with two separate semester cohort students representing the control and intervention groups which had 24 and 30 students	The scores on the self-directed learning readiness (SDLR) tool, particularly the subscales of self-management, desire for learning, and self-control.	use of information technology and prescribed activities in an online e-book for teaching first-year nursing students enrolled in an "Anatomy and Physiology" course.	The intervention group included 30 students who utilized a blended learning modality, incorporating both online e-books and information technology alongside traditional methods.	The control group consisted of 24 students who received all their teaching face-to-face. This group followed the traditional educational approach without the use of the blended learning elements.

11. Ya Meng, Jian Song, Xiaojing Yu, Xiaoxia Xu, Hao Zhang	**Design and evaluation of blended teaching in the smart classroom combined with virtual simulation training in basic nursing courses**	Oct. 11, 2023	China	Quasi-experimental study.	135 undergraduate nursing students from the 2021 cohort, divided into two groups: • Experimental group (Class 1) with 71 students. • Control group (Class 2) with 64 students.	**Independent Variable:** Teaching method (smart classroom combined with virtual simulation training vs. traditional lecture-based teaching). **Dependent Variables:** Academic performance (test scores), independent learning ability, and teaching effectiveness (measured by a questionnaire).	The experimental group received a blended teaching design utilizing a smart classroom and virtual simulation training.	The intervention was implemented through a blended teaching approach combining online and classroom methods.	The control group received traditional lecture-based teaching.
12.Yawei Shan, Xuemei Zhou,	**Innovations in teachin**	November	China	Quasi-experi	Total of 270 valid data points.	**Independent Variable:**	Implementation of	Various modes	Comparison across

Wenwen Qi, Xiao Liu & Chu xian Huang	**g during the COVID-19 pandemic: comparisons of the impacts of different teaching approaches in psychiatric nursing on undergraduate nursing students**	3, 2023		mental study	□ Students divided into four classes: • **Class A in 2021:** Face-to-face teaching. • **Class B in 2021:** Blended teaching with flipped classroom using rol	Type of teaching design (face-to-face, blended with flipped classroom and roleplay, live broadcast, online blended with flipped classroom and case studies). □ **Dependent Variables:** Academic performance scores and course workload.	different teaching designs during the COVID-19 pandemic.	including face-to-face, live broadcast, blended learning with flipped classroom and roleplay, and online blended learning with flipped classroom and case studies.	different teaching methods with no traditional control group; however, face-to-face teaching in Class A (2021) and live broadcast teaching in Class A (2022) may serve as reference points.

					eplay. • **Class A in 2022:** Live broadcast teaching. • **Class B in 2022:** Online blended teaching with flipped classroom using case stu				

					dies.				
13. Tzu-Hao Huang, Fen Liu, Li-Chen Chen, Ching-Ching Tsai	**The acceptance and impact of Google Classroom integrating into a clinical pathology course for nursing students: A technology acceptance model approach**	March 5, 2021	Taiwan	Randomized controlled study.	74 nursing students in Taiwan, randomly assigned to: • **Experimental group:** 39 students. • **Control group:** 35 students.	**Independent Variables:** • Type of teaching method (blended learning using Google Classroom vs. traditional teaching). **Dependent**	The experimental group received one hour of traditional teaching combined with Google Classroom (GC) per week. The control group received two hours of traditional teaching per week.	Blended learning (traditional teaching combined with Google Classroom) for the experimental group. Traditional face-to-face teaching for the control group.	The control group received traditional teaching methods without the use of Google Classroom.

						Variables: • Technology acceptance (including perceived ease of use, perceived playfulness, perceived usefulness).			

						• Intention to use Google Classroom. • Learning satisfaction. • Academic achievement.			

Table 2. Evidence Table

RESULTS

A. Distribution of the Selected Studies

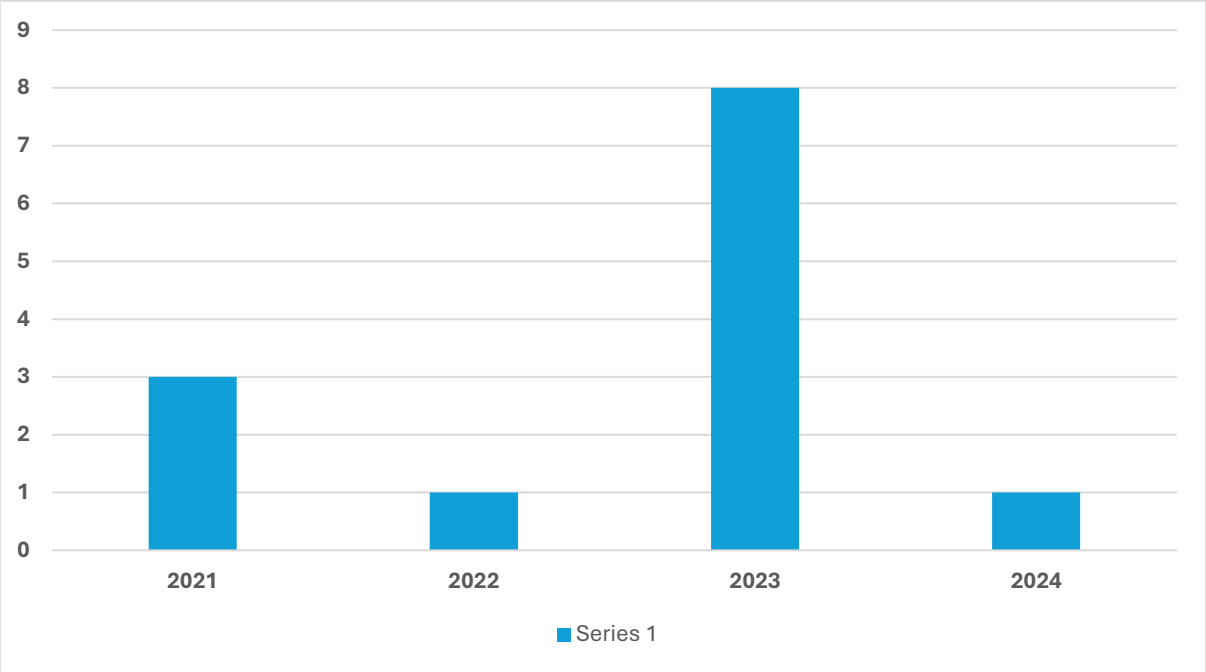

Figure 2. Distribution of the Selected Studies

The research on blended and online learning has flourished significantly. The chosen studies were analyzed based on the published year to find the maximum number of articles published in a particular year. 13 papers were chosen for the current review in the study. In the following chart, the total number of papers selected for the systematic review and their publication have been categorized. The total number of papers was high in the year 2023 (n=8).

B. Approach, Method Strategy Used in the Selected Papers

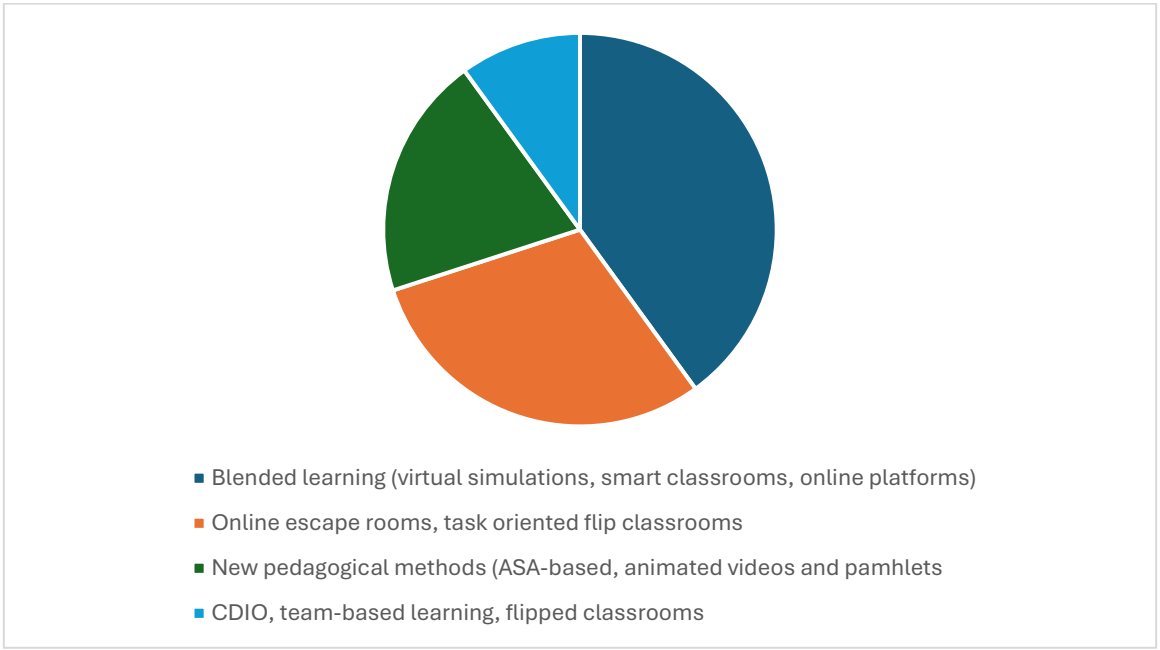

Figure 3. Approach, Method and Strategy Used in the Selected Papers

The methods commonly used in the selected studies involved a range of innovative educational strategies aimed at improving student learning outcomes. Figure 3 categorizes the approaches utilized across the studies, which highlight the growing adoption of web-based and blended learning techniques. The following key inferences were drawn from the data: 40% of the papers implemented blended learning techniques, combining traditional face-to-face learning with web-based components like virtual simulations, smart classrooms, and online platforms such as Google Classroom; 30% of the studies focused on online education methods, leveraging tools like online escape rooms (OGBER) and task-oriented flipped classrooms, aimed at promoting active learning through self-paced, interactive environments; 20% of the studies explored the effectiveness of traditional education compared to newer pedagogical methods, such as ASA-based programs utilizing animated videos and pamphlets versus conventional face-to-face education and 10% of the papers incorporated specialized education models like CDIO (conceive–design–implement–operate) and team-based learning, which emphasize collaborative and experiential learning through flipped classrooms and peer teaching activities.

C. Level of Samples Used in the Study

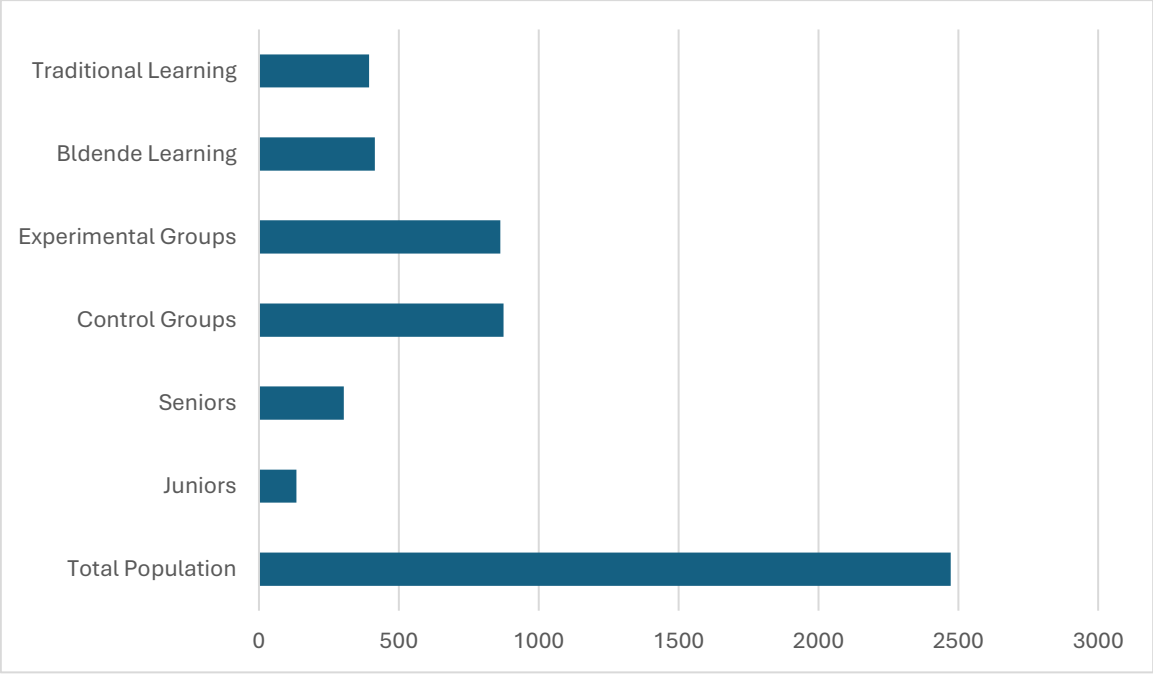

Figure 4. Level of Samples Used in the Study

Across the selected studies, the total population was 2,473 nursing students. A significant portion of the samples involved senior and junior students, with 134 juniors and 303 seniors, divided into Level II (105 students) and Level III (198 students). Many studies employed both control and experimental groups, with a total of 863 students in experimental groups and 874 students in control groups. Additionally, several studies compared blended learning and traditional learning methods, with 414 students participating in blended learning environments and 394 students in traditional lecture-based settings. This variation in sample groups demonstrates the comprehensive approach taken by researchers to evaluate different educational strategies in nursing education.

D. Significance of the Studies

The significance of these studies lies in their exploration of innovative educational strategies that address the evolving needs of nursing students. Traditional teaching methods, while valuable, may not fully equip students with the necessary critical thinking and clinical skills required in today's healthcare settings. The research highlights the importance of adopting alternative methods, such as web-based learning, blended formats, and flipped classrooms, to enhance nursing education. These approaches foster active learning, increase engagement, and provide students with real-time feedback, thereby better preparing them for the practical demands of the profession. The studies emphasize that integrating technology and simulation in nursing education is no longer optional but necessary to keep pace with advancements in healthcare and education. The findings serve as a foundation for further innovation in teaching strategies, reinforcing the need to adapt nursing curricula to meet current healthcare challenges.

E. Impact of Online and Blended Learning

The impact of these innovative teaching approaches is reflected across all reviewed studies. Zaybak et al. (2023) demonstrated that web-based education significantly improved students' ability to apply the nursing process, resulting in greater knowledge retention and satisfaction. Agamata et al. (2021) underscored the importance of hands-on practice, showing that face-to-face learning was more effective in enhancing psychomotor skills such as intramuscular injection. Ching-Hsueh Yeh & Yang (2024) illustrated how assessment-simulation-animation (ASA) education not only reduced anxiety but also boosted self-efficacy in maternity clinical practice, critical to fostering student confidence. Similarly, Li et al. (2023) found that a blended task-oriented flipped classroom model led to substantial improvements in problem-solving and critical thinking abilities. Su et al. (2023) echoed these findings, demonstrating that combining flipped classrooms with the CDIO concept (conceive–design–implement–operate) significantly enhanced clinical practice capabilities, self-directed learning, and critical thinking.

These studies collectively show the transformative potential of blending traditional teaching methods with innovative, technology-driven approaches. Not only do these methods enhance academic performance, but they also prepare students for the complexities of real-world healthcare, promoting self-directed, confident, and competent nursing professionals.

V. Discussion

The reviewed studies underscore the growing importance of integrating innovative teaching strategies in nursing education to enhance students' learning outcomes and readiness for clinical practice. The principal findings reveal that web-based education, blended learning, and simulation-based approaches, such as the flipped classroom and assessment-simulation-animation (ASA) models, significantly improve critical thinking, clinical skills, and self-efficacy among nursing students. Zaybak et al. (2023) highlighted how web-based education improved knowledge retention, while Agamata et al. (2021) found that traditional face-to-face methods were more effective for psychomotor skill acquisition. Meanwhile, both Li et al. (2023) and Su et al. (2023) demonstrated that blended learning approaches significantly enhanced critical thinking, problem-solving, and self-directed learning. Collectively, these findings emphasize the need for nursing education programs to incorporate a variety of teaching methods that not only focus on theoretical knowledge but also emphasize the development of practical, clinical skills crucial for nursing practice.

Despite the promising findings, the studies reviewed present several limitations. Most studies had relatively small sample sizes, limiting the generalizability of the results to broader populations of nursing

students. Additionally, the heterogeneity of interventions across different studies made it difficult to directly compare outcomes, as different teaching approaches and metrics for success were utilized. Furthermore, many studies focused on short-term outcomes such as immediate knowledge retention or skill acquisition, with fewer examining long-term impacts on clinical performance or patient care outcomes. Another limitation is the reliance on self-reported measures, which may introduce bias due to students overestimating or underestimating their skills and learning outcomes. Finally, most studies were conducted in specific educational and cultural contexts, potentially limiting the applicability of the results to other settings or countries with different healthcare and educational systems.

Conclusion

This review highlights the evolving landscape of nursing education, with an emphasis on integrating diverse, innovative teaching strategies such as web-based, blended, and simulation-based learning to enhance the knowledge, skills, and clinical competence of nursing students. The findings demonstrate that these methods contribute significantly to improving critical thinking, self-efficacy, and clinical preparedness, underscoring the need for their wider adoption in nursing curricula. However, limitations such as small sample sizes, short-term focus, and reliance on self-reported outcomes suggest that more robust, long-term research is needed to fully understand the effectiveness and sustainability of these educational interventions. Moving forward, nursing education must continue to adapt, incorporating new technologies and evidence-based approaches to better prepare future nurses for the complexities of modern healthcare practice.

Recommendations

Future research should address the limitations identified by including larger, more diverse samples to enhance the generalizability of the findings. Longitudinal studies that track the long-term impacts of innovative teaching strategies on clinical competence and patient care outcomes are also recommended to determine their sustained effectiveness. Comparative studies that directly assess the effectiveness of different educational approaches—such as traditional, web-based, blended, and simulation-based learning—across various clinical disciplines and cultural settings would provide a more comprehensive understanding of their impacts. Additionally, incorporating objective, performance-based assessments alongside self-reported measures could provide a more accurate evaluation of student progress. Finally, research should explore the integration of emerging technologies, such as virtual reality (VR) and artificial intelligence (AI), in nursing education to assess their potential in further enhancing clinical skills and critical thinking.

Compliance with Ethical Standards

In conducting this systematic review, the authors adhered to the highest ethical standards and guidelines. All data sources used were publicly available or previously published, ensuring no breach of confidentiality or privacy. The review process was carried out with objectivity, transparency, and rigor to maintain the integrity of the findings. Any conflicts of interest were disclosed, and all efforts were made to minimize bias. This study complies with ethical principles as outlined in relevant guidelines, including respect for intellectual property and appropriate attribution of all sources.

Acknowledgments

The authors would like to express their sincere gratitude to all those who contributed to the successful completion of this systematic review. They extend their heartfelt thanks to their academic advisor for guidance and support throughout the research process. Special thanks are due to the library and information services for assisting with literature retrieval and access to essential databases. Finally, the authors are grateful for the support of their families and friends, whose encouragement motivated them during challenging times. This work would not have been possible without the contributions of these individuals and organizations.

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