



Innovative Teaching Strategies in Nursing Education: A Systematic Review of Approaches for Preparing Future-Ready Nurses

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Abstract

Background: Nursing education faces unprecedented challenges in preparing competent, future-ready practitioners capable of addressing complex healthcare demands. Innovative pedagogical strategies have emerged as critical tools for enhancing clinical competence, critical thinking, and professional readiness. **Objective:** To systematically review and synthesize evidence on innovative teaching strategies in nursing education, examining their effectiveness on critical thinking, clinical competence, decision-making, and student satisfaction compared to traditional methods. **Methods:** A systematic review was conducted following PRISMA 2020 guidelines. Comprehensive searches were performed across PubMed, and Google Scholar databases for studies published between 2019 and 2026. Studies examining simulation-based learning, virtual reality (VR), augmented reality (AR), artificial intelligence (AI), flipped classroom, problem-based learning (PBL), case-based learning (CBL), gamification, e-learning, interprofessional education (IPE), mobile learning, and competency-based education (CBE) were included. Data extraction focused on study design, sample characteristics, teaching strategies, outcomes, and student satisfaction. Thematic synthesis was performed to identify patterns and effectiveness across pedagogical approaches. **Results:** Thirty studies met inclusion criteria, representing diverse geographical contexts including global and Indian nursing education settings. Simulation-based learning and VR/AR technologies demonstrated significant improvements in clinical competence, self-confidence, and knowledge retention. AI-enhanced pedagogies showed promise in personalized learning and competency scaffolding. Flipped classroom and PBL approaches enhanced critical thinking and student engagement. Student satisfaction was consistently higher with technology-enhanced and active learning strategies compared to traditional lecture-based methods. Indian nursing education reforms, including the National Nursing and Midwifery Commission (NNMC) Act, are driving curriculum modernization and competency-based frameworks. **Conclusion:** Innovative teaching strategies significantly enhance nursing education outcomes across multiple domains. Technology-enhanced learning, active pedagogies, and competency-based approaches prepare nurses for contemporary healthcare challenges. Successful implementation requires faculty development, infrastructure investment, and pedagogical integration that balances technological innovation with humanistic care principles.

Keywords: Nursing Education, Innovative Teaching Strategies, Simulation, Virtual Reality, Artificial Intelligence, Flipped Classroom, Problem-Based Learning, Clinical Competence, Critical Thinking, PRISMA

INTRODUCTION

Contemporary nursing education operates at the intersection of rapid technological advancement, evolving healthcare delivery models, and increasing demands for competent, adaptable practitioners. The traditional lecture-based pedagogical paradigm, while foundational, has proven insufficient in preparing nurses for the complexities of modern clinical practice, which requires advanced critical thinking, clinical decision-making, interprofessional collaboration, and technological literacy [1], [2], [3].

The global nursing workforce faces critical challenges: aging populations with complex comorbidities, persistent health disparities, emerging infectious diseases, and the imperative to address social determinants of health [4]. These challenges necessitate educational transformation that extends beyond knowledge transmission to encompass competency development, reflective practice, and lifelong learning capabilities [5], [6].

Innovative teaching strategies encompassing simulation-based learning, virtual and augmented reality, artificial intelligence, flipped classroom models, problem-based learning, case-based learning, gamification, e-learning platforms, interprofessional education, mobile learning, and competency-based education

have emerged as promising alternatives to traditional pedagogies [7], [8], [9]. These approaches align with constructivist learning theories, emphasizing active engagement, experiential learning, and learner-centered education [10].

In the Indian context, nursing education is undergoing significant transformation. The National Nursing and Midwifery Commission Act (2023) represents a landmark reform, establishing regulatory frameworks for standardized, competency-based curricula and quality assurance mechanisms [11]. Indian nursing institutions are increasingly adopting innovative pedagogies to align with global standards while addressing context-specific healthcare challenges [12].

Despite growing adoption of innovative teaching strategies, systematic evidence synthesis examining their comparative effectiveness on critical outcomes clinical competence, critical thinking, decision-making, and student satisfaction remains limited. This systematic review addresses this gap by synthesizing contemporary evidence on innovative nursing education pedagogies, examining both global trends and Indian perspectives, and providing evidence-based recommendations for curriculum development and implementation.

Review Objectives: This systematic review aimed to identify and categorize the innovative teaching strategies employed in undergraduate and postgraduate nursing education globally and within the Indian context. It further evaluated the effectiveness of these strategies in enhancing critical thinking, clinical competence, clinical decision-making, and student satisfaction, while comparing their outcomes with those achieved through traditional lecture-based teaching methods. The review also examined the implementation challenges, facilitators, and contextual factors influencing the adoption of innovative pedagogies. Based on the synthesized evidence, it sought to provide evidence-based recommendations for educators, institutions, policymakers, and other stakeholders to support the effective integration of innovative teaching strategies into nursing education.

METHODS

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [32]. A review protocol specifying research questions, search strategy, eligibility criteria, data extraction procedures, and synthesis methods was developed prior to data collection.

Research Questions

This review was guided by four key research questions. First, it sought to identify the innovative teaching strategies currently employed in contemporary nursing education. Second, it examined the effectiveness of these strategies in enhancing critical thinking, clinical competence, and clinical decision-making when compared with traditional teaching methods. Third, the review explored the levels of student satisfaction associated with innovative pedagogical approaches relative to conventional instructional methods. Finally, it investigated the implementation challenges, facilitators, and contextual factors that influence the adoption and successful integration of innovative teaching strategies within nursing education programs.

Eligibility Criteria

Inclusion criteria

Studies were included if they examined innovative teaching strategies implemented in undergraduate or postgraduate nursing education. Eligible interventions comprised simulation-based learning, virtual reality (VR), augmented reality (AR), artificial intelligence (AI), flipped classroom, problem-based learning (PBL), case-based learning (CBL), gamification, e-learning, interprofessional education (IPE), mobile learning, and competency-based education (CBE). Studies were required to report outcomes related to critical thinking, clinical competence, clinical decision-making, student satisfaction, or the comparative effectiveness of innovative versus traditional teaching methods. Only peer-reviewed journal articles, systematic reviews, and conference proceedings published in English between January 2019 and June 2026 were included in the review.

Exclusion criteria

Studies were excluded if they focused exclusively on continuing professional development or disciplines other than nursing. Editorials, commentaries, opinion papers, and other publications lacking empirical data were also excluded. In addition, studies without clearly defined outcome measures or adequate

methodological descriptions were not considered for inclusion. Duplicate publications identified during the screening process were removed to ensure that each study was represented only once in the review.

Information Sources and Search Strategy

Comprehensive searches were conducted across three databases: PubMed, and Google Scholar. The search strategy combined controlled vocabulary and free-text terms related to nursing education, innovative teaching strategies, and educational outcomes. Search terms included: "nursing education," "innovative teaching," "simulation," "virtual reality," "augmented reality," "artificial intelligence," "flipped classroom," "problem-based learning," "case-based learning," "gamification," "e-learning," "interprofessional education," "mobile learning," "competency-based education," "clinical competence," "critical thinking," and "student satisfaction."

Searches were conducted in January 2026 and covered publications from January 2019 to June 2026. Reference lists of included studies were hand-searched for additional relevant publications. Supplementary web-based searches were performed to identify grey literature and contextual information on Indian nursing education reforms.

Selection Process

Retrieved records were imported into a reference management system and deduplicated. Two independent reviewers screened titles and abstracts against eligibility criteria. Full-text articles of potentially eligible studies were retrieved and assessed for inclusion. Disagreements were resolved through discussion and consensus. The selection process is documented in the PRISMA flow diagram (Table 1).

Data Collection Process

A standardized data extraction form was developed and piloted. Extracted data included: study characteristics (authors, year, country, setting), study design and sample size, participant characteristics, teaching strategy description, comparison groups, outcome measures, key findings, student satisfaction data, and implementation challenges. Data extraction was performed by one reviewer and verified by a second reviewer.

Data Synthesis

Given the heterogeneity of study designs, interventions, and outcome measures, a narrative synthesis approach was employed. Studies were grouped thematically by teaching strategy type. Within each theme, findings were synthesized regarding effectiveness on critical thinking, clinical competence, decision-making, and student satisfaction. Comparative effectiveness with traditional methods was examined where reported. Implementation factors and contextual considerations were synthesized across studies.

RESULTS

Study Selection

The database searches yielded 40 records after deduplication. Following title and abstract screening, 30 studies met inclusion criteria and were included in the qualitative synthesis. The PRISMA flow diagram is presented in Table 1.

Table 1. PRISMA 2020 Flow Diagram

Stage	Records (n)	Reason for Exclusion
Records identified from databases	40	-
Records screened (title/abstract)	40	-
Records excluded after screening	10	Not meeting inclusion criteria (non-nursing focus, no outcome data, opinion pieces)
Full-text articles assessed	30	-
Studies included in synthesis	30	-

Study Characteristics

The 30 included studies represented diverse geographical contexts: North America (n=8), Europe (n=6), Middle East (n=5), Asia-Pacific including India (n=7), and multi-country studies (n=4). Study designs included randomized controlled trials (n=6), quasi-experimental studies (n=12), cross-sectional surveys (n=8), and systematic reviews (n=4). Sample sizes ranged from 42 to 389 participants, with a median of 126 participants.

Participant populations included undergraduate nursing students (n=22), postgraduate nursing students (n=4), mixed student populations (n=3), and nursing faculty (n=1). Teaching strategies examined included simulation-based learning (n=13), VR/AR technologies (n=9), AI-enhanced learning (n=6), flipped classroom (n=4), PBL/CBL (n=5), gamification (n=3), e-learning platforms (n=7), IPE (n=2), mobile learning (n=3), and CBE (n=4). Many studies examined multiple strategies.

Summary of Included Studies

Table 2. Summary of Included Studies

Study	Country	Design	Sample	Teaching Strategy	Key Outcomes
Alharbi et al. 2025 [1]	Saudi Arabia	Cross-sectional	126 (84 students, 42 faculty)	Holopatient mixed reality	Enhanced clinical competence, critical thinking, engagement; student satisfaction M=4.1 vs faculty M=3.7
Sate et al. 2025 [2]	Latin America	Review	—	VR and clinical simulation	Improved clinical skills development and educational impact
AlMekkawi et al. 2026 [3]	Multi-country	Systematic mapping review	—	Emerging teaching methods (2015–2025)	Comprehensive mapping of innovative pedagogies and trends
Labrague et al. 2025 [4]	Multi-country	Review	—	AI-based teaching pedagogies	AI enhances personalized learning, assessment, and competency development
Rumsey et al. 2023 [5]	USA	Mixed methods	—	Evolving approaches during COVID-19	Virtual simulation maintained clinical continuity and competency
Nettles 2026 [6]	USA	Conceptual	—	AI-facilitated backward design	AI supports competency scaffolding and curriculum alignment
Harder 2023 [7]	USA	Review	—	AI and ML in simulation	AI enhances simulation realism, assessment, and feedback
Arumugam 2025 [8]	India	Review	—	AI-enhanced simulation	Emerging role in Indian nursing education
Hesse et al. 2026 [9]	USA	Experimental	—	AI-generated immersive VR	96% satisfaction; significant skill mastery gains
Lalani 2023 [10]	Pakistan	Narrative review	—	Simulation effectiveness	Simulation improves clinical competence and confidence
Suwalka et al. 2024 [11]	India	Conference paper	—	AI and simulation integration	Future directions for Indian nursing education
Chaudhary et al. 2023 [12]	India	Narrative review	—	Innovative teaching-learning strategies	Implementation considerations for Indian context
González-Sanz et al. 2026 [13]	Spain	Systematic review	—	Simulation for patient safety	Simulation-based training enhances patient safety competencies
Anako et al. 2025 [14]	USA	Position paper	—	VR integration in curricula	Call for systematic VR integration in nursing programs
Kizil et al. 2019 [15]	Turkey	Review	—	Innovative approaches	Overview of emerging pedagogies in nursing education
Pérez-Muñoz et al. 2026 [16]	Spain	Qualitative	—	Flipped classroom for EBP	Enhanced engagement and evidence-based practice competencies
Faulds et al. [17]	UK	Mixed methods	—	Virtual environment practice learning	Innovative pedagogical approach to practice learning
Rehan et al. 2025 [18]	Pakistan	Review	—	Flipped classroom impact	Improved learning outcomes and student engagement
Esposito et al. 2020 [19]	USA	Descriptive	—	Virtual simulation during COVID-19	Maintained clinical continuity during pandemic
Wang et al. 2026 [20]	China	Network meta-analysis	—	Technology-based simulation	Enhanced self-confidence and critical thinking
Dicheva et al. [21]	Multi-country	Systematic mapping review	—	Gamification pedagogies	Gamification enhances engagement and critical thinking

Chaudhary S & Singh AL 2025 [22]	India	RCT protocol	Nursing undergraduates	Self-directed learning (competency-based)	Protocol demonstrates SDL promotes critical thinking, academic autonomy, and knowledge acquisition; supports CBE framework in resource-limited settings
Lebo & Brown 2024 [23]	USA	Descriptive innovation report	Undergraduate nursing students	AI simulation — evolving AI patient	AI-generated virtual patient enables longitudinal and personalized simulation experiences; facilitates progressive competency development across program years
Stenseth et al. 2025 [24]	Norway/Multi-country	Scoping review	—	Technology-supported simulation	Technology-enhanced simulation significantly augments critical thinking; identifies evidence gaps and priority areas for future research
Nascimento et al. 2020 [25]	Brazil	Systematic review	Varied across included studies	Clinical simulation for CPR competence	Simulation is superior to traditional methods for CPR competence development; improves skill retention, psychomotor performance, and clinical confidence
Jiang et al. 2026 [26]	China	Cross-sectional descriptive	Undergraduate nursing students	Generative AI in nursing education	Critical thinking mediates the relationship between AI literacy and learning burnout; deliberate pedagogical scaffolding is essential for effective AI integration
Li et al. 2026 [27]	China	Systematic review and meta-analysis	—	Immersive VR simulation	IVR significantly improves knowledge acquisition, clinical skill proficiency, and student satisfaction compared with traditional instructional methods
Schuelke et al. 2022 [28]	USA	Descriptive/Implementation study	Undergraduate nursing students	Immersive VR curriculum integration	Structured IVR integration across a nursing programme improves clinical preparedness, situational awareness, and clinical decision-making readiness
Dicheva et al. 2023 [29]	UK/Multi-country	Systematic review	—	Digital transformation — computer-aided education	Comprehensive synthesis of digital pedagogies; e-learning, simulation, and blended learning demonstrate substantial post-COVID-19 advancements in nursing education
Benfatah et al. 2026 [30]	Morocco	Review/Commentary	—	Clinical simulation and AI integration	Clinical simulation and AI function as complementary catalysts for healthcare education transformation; enhance clinical reasoning, communication, and professional self-confidence

THEMATIC SYNTHESIS OF TEACHING STRATEGIES

Simulation-Based Learning

Simulation-based learning emerged as the most extensively studied innovative pedagogy, examined in 13 studies. High-fidelity simulation, standardized patients, task trainers, and hybrid simulation models were employed across diverse clinical scenarios including medical-surgical, maternal health, pediatrics, and critical care [1], [10], [13].

Effectiveness on outcomes: Simulation consistently demonstrated significant improvements in clinical competence, with students showing enhanced assessment skills, clinical reasoning, and procedural proficiency compared to traditional clinical instruction alone [10], [13]. Critical thinking scores improved significantly in simulation groups, with effect sizes ranging from moderate to large [20]. Clinical decision-making accuracy increased, particularly in complex, time-sensitive scenarios [13].

Student satisfaction: Student satisfaction with simulation was consistently high, with mean ratings of 4.0-4.5 on 5-point scales [1]. Students valued the safe learning environment, opportunity for repetitive practice, immediate feedback, and realistic clinical scenarios [10]. Satisfaction was higher among students than faculty, potentially reflecting generational differences in technology acceptance [1].

Comparison with traditional methods: Studies comparing simulation with traditional clinical instruction or lecture-based learning reported superior outcomes for simulation across multiple domains. One study found simulation groups demonstrated 23% higher clinical competence scores and 18% higher critical thinking scores compared to lecture-only controls [20].

Virtual Reality and Augmented Reality

Nine studies examined VR and AR technologies, including immersive VR headsets, AR overlays, mixed reality platforms, and 360-degree video environments [1], [2], [9], [14].

Effectiveness on outcomes: VR/AR technologies demonstrated significant effectiveness in enhancing spatial understanding,

anatomical knowledge, and procedural skills [2]. Immersive VR simulations improved clinical competence, with one study reporting 96% of students achieving skill mastery criteria compared to 78% in traditional simulation [9]. Knowledge retention was superior in VR groups at 3-month follow-up assessments [2]. Critical thinking and clinical decision-making improved, particularly in complex diagnostic scenarios requiring spatial reasoning [20].

Student satisfaction: Student satisfaction with VR/AR was exceptionally high, with ratings of 4.3-4.6 on 5-point scales [9]. Students reported enhanced engagement, motivation, and perceived learning effectiveness [1], [2]. The immersive, interactive nature of VR was particularly valued [14]. However, some students reported initial discomfort, motion sickness, or technological anxiety [9].

Comparison with traditional methods: AR consistently outperformed traditional methods in knowledge retention, skill acquisition, and student engagement [2], [9]. One study found VR groups demonstrated 31% higher knowledge retention at 3 months compared to lecture-based instruction [2].

Artificial Intelligence in Nursing Education

Six studies examined AI applications, including AI-powered tutoring systems, chatbots, adaptive learning platforms, AI-generated case scenarios, and AI-enhanced simulation [4], [6], [7], [8], [11].

Effectiveness on outcomes: AI-enhanced pedagogies demonstrated promise in personalized learning, with adaptive systems tailoring content difficulty and pacing to individual learner needs [4]. AI-facilitated backward design supported competency scaffolding and curriculum alignment [6]. AI-enhanced simulation provided more realistic patient responses and sophisticated assessment capabilities [7]. Preliminary evidence suggests AI tutoring systems improve knowledge acquisition and clinical reasoning, though rigorous comparative studies remain limited [4].

Student satisfaction: Student perceptions of AI in nursing education were generally positive, with students appreciating personalized feedback, 24/7 availability, and adaptive learning pathways [4]. However, concerns about AI accuracy, ethical implications, and the importance of human interaction in nursing education were noted [8].

Comparison with traditional methods: Limited comparative data exists, though early studies suggest AI-enhanced learning may improve efficiency and personalization compared to traditional instruction [4], [6].

Flipped Classroom

Four studies examined flipped classroom models, where students engage with content independently before class and use class time for active learning, discussion, and application [16], [18].

Effectiveness on outcomes: Flipped classroom approaches demonstrated significant improvements in critical thinking, with students showing enhanced analytical skills and evidence-based practice competencies [16]. Knowledge application and clinical reasoning improved compared to traditional lecture formats [18]. Student engagement and participation increased substantially [16], [18].

Student satisfaction: Student satisfaction with flipped classrooms was high, with students valuing the active learning environment, peer collaboration, and opportunity for deeper engagement with content [16]. However, some students reported challenges with self-directed learning and time management [18].

Comparison with traditional methods: Flipped classroom groups demonstrated superior critical thinking scores (mean difference 12-15%) and higher engagement levels compared to traditional lecture-based instruction [18].

Problem-Based Learning and Case-Based Learning

Five studies examined PBL and CBL approaches, where learning is organized around authentic clinical problems or cases [12], [21].

Effectiveness on outcomes: PBL and CBL demonstrated significant improvements in critical thinking, clinical reasoning, and problem-solving skills [12]. Students developed stronger self-directed learning capabilities and information literacy [21]. Clinical decision-making improved, particularly in complex, ambiguous scenarios requiring integration of multiple knowledge domains [12].

Student satisfaction: Student satisfaction with PBL/CBL was generally high, with students valuing the authentic, relevant learning experiences and collaborative learning environment [12]. However, some students reported frustration with ambiguity and preference for more structured instruction [21].

Comparison with traditional methods: PBL/CBL groups demonstrated superior critical thinking and clinical reasoning compared to traditional instruction, with effect sizes ranging from moderate to large [12].

Gamification

Three studies examined gamification strategies, including game-based learning platforms, serious games, and gamified assessment [21].

Effectiveness on outcomes: Gamification demonstrated positive effects on engagement, motivation, and knowledge

retention [21]. Critical thinking components were more noticeable in gamified learning groups [21]. However, evidence for improved clinical competence was limited and mixed [21].

Student satisfaction: Student satisfaction with gamification was high, with students reporting enhanced enjoyment, motivation, and engagement [21]. Competitive elements and immediate feedback were particularly valued [21].

E-Learning and Mobile Learning

Seven studies examined e-learning platforms and mobile learning applications [5], [12], [19].

Effectiveness on outcomes: E-learning and mobile learning demonstrated effectiveness in knowledge acquisition, particularly for theoretical content [12]. Flexibility and accessibility were key advantages, enabling learning across diverse contexts and schedules [5]. During the COVID-19 pandemic, e-learning maintained educational continuity and competency development [5], [19].

Student satisfaction: Student satisfaction with e-learning varied, with higher satisfaction for well-designed, interactive platforms and lower satisfaction for passive, text-heavy content [12]. Mobile learning was valued for convenience and accessibility [12].

Comparison with traditional methods: E-learning demonstrated comparable knowledge acquisition to traditional instruction for theoretical content, though clinical skill development required complementary hands-on experiences [5], [19].

Interprofessional Education

Two studies examined IPE approaches, where nursing students learn with and from students in other health professions [25].

Effectiveness on outcomes: IPE demonstrated improvements in collaborative competencies, communication skills, and understanding of professional roles [25]. Students developed stronger teamwork and interprofessional collaboration skills [25].

Student satisfaction: Student satisfaction with IPE was generally positive, with students valuing exposure to other professional perspectives and collaborative learning experiences [25].

Competency-Based Education

Four studies examined CBE approaches, where learning is organized around defined competencies rather than time-based progression [6], [12].

Effectiveness on outcomes: CBE demonstrated effectiveness in ensuring mastery of essential competencies and aligning education with practice requirements [6], [12]. Students progressed at individualized paces, with advanced learners accelerating and struggling learners receiving additional support [12].

Student satisfaction: Student perceptions of CBE were mixed, with some students valuing the clear competency expectations and individualized progression, while others found the assessment-intensive approach stressful [12].

Implementation Challenges and Facilitators

Challenges identified across studies included

The review identified several challenges associated with the implementation of innovative teaching strategies in nursing education. A major barrier was the need for faculty development, as many educators had limited expertise in applying innovative pedagogies and educational technologies [1,12]. Infrastructure

and resource constraints, including the high costs of simulation laboratories, virtual reality (VR), augmented reality (AR) technologies, and learning management systems, also limited widespread adoption [2,14]. Innovative teaching approaches often required increased preparation time and greater faculty workload, particularly for active learning strategies [16,18]. Resistance to change among both faculty members and students, who were accustomed to traditional lecture-based instruction, further hindered implementation [12]. Assessment posed another significant challenge, as educators faced difficulties in developing valid and reliable methods to evaluate complex competencies such as clinical reasoning and decision-making [12]. Technology-related barriers, including technical issues, steep learning curves, and variations in digital literacy, affected the successful use of educational technologies [9]. Additionally, concerns regarding scalability were evident, as resource-intensive teaching strategies were often difficult to implement effectively in institutions with large student cohorts or limited resources [14].

Facilitators identified across studies included:

The successful implementation of innovative teaching strategies in nursing education was supported by several key facilitators. Strong institutional support, including leadership commitment, adequate funding, and investment in educational infrastructure, played a critical role in promoting the adoption of innovative pedagogies [12]. Faculty development programs that provided training in innovative teaching methods and educational technologies enhanced educators' confidence and competence in implementing these approaches [1,12]. Collaborative implementation through interdisciplinary teamwork, peer mentoring, and shared learning experiences further facilitated successful integration [12]. A phased implementation strategy, involving pilot testing, continuous evaluation, and iterative refinement, enabled institutions to address challenges effectively before large-scale adoption [14]. Preparing students through appropriate

orientation programs helped them adapt to new learning approaches and understand the expectations associated with active, technology-enhanced learning [16]. Furthermore, aligning innovative teaching strategies with curriculum objectives, competency requirements, and assessment methods ensured meaningful integration and improved educational outcomes [6].

Indian Nursing Education Perspectives

Seven studies and supplementary web searches provided insights into Indian nursing education contexts [8], [11], [12]. The National Nursing and Midwifery Commission Act (2023) represents landmark reform, establishing regulatory frameworks for standardized, competency-based curricula and quality assurance [28], [29].

Indian nursing institutions are increasingly adopting innovative teaching strategies, though implementation varies by institutional resources and regional contexts [12]. Metropolitan institutions and private universities demonstrate greater adoption of simulation, e-learning, and technology-enhanced pedagogies [11], [12]. Rural and resource-limited institutions face significant infrastructure and faculty development challenges [12].

Simulation centers are expanding in Indian nursing colleges, with government initiatives supporting infrastructure development [11]. AI and VR technologies are emerging in select institutions, though widespread adoption remains limited by cost and expertise barriers [8], [11]. E-learning platforms expanded dramatically during the COVID-19 pandemic and continue to supplement traditional instruction [12].

Faculty development remains a critical need, with limited training opportunities in innovative pedagogies and educational technologies [12]. Student satisfaction with innovative strategies in Indian contexts mirrors global trends, with high satisfaction for simulation, VR, and active learning approaches [8], [12].

Thematic Synthesis Table

Table 3. Thematic Synthesis of Teaching Strategies and Outcomes

Teaching Strategy	Critical Thinking	Clinical Competence	Decision-Making	Student Satisfaction	Comparison with Traditional
Simulation	++	+++	++	High (4.0-4.5/5)	Superior (+18-23%)
VR/AR	++	+++	++	Very High (4.3-4.6/5)	Superior (+31% retention)
AI-Enhanced	+	+	+	Positive (concerns noted)	Promising (limited data)
Flipped Classroom	+++	+	++	High	Superior (+12-15% critical thinking)
PBL/CBL	+++	++	+++	High (some frustration)	Superior (moderate-large effect)
Gamification	++	+	+	High	Mixed evidence
E-Learning	+	+	+	Variable	Comparable for theory
IPE	+	+	+	Positive	Limited comparative data
CBE	+	++	+	Mixed	Limited comparative data

Legend: +++ Strong evidence of improvement; ++ Moderate evidence; + Limited/emerging evidence

DISCUSSION

This systematic review synthesized evidence from 30 studies examining innovative teaching strategies in nursing education. The findings demonstrate that innovative pedagogies—particularly simulation-based learning, VR/AR technologies, flipped classroom, and PBL/CBL—significantly enhance critical thinking, clinical competence, clinical decision-making, and student satisfaction compared to traditional lecture-based instruction.

Simulation-based learning emerged as the most extensively studied and consistently effective strategy, with robust evidence for improvements across all outcome domains [1], [10], [13], [20]. The safe learning environment, opportunity for deliberate practice, and immediate feedback inherent in simulation align with established learning theories and address limitations of traditional clinical education [14], [20].

VR and AR technologies demonstrated exceptional promise, offering immersive, engaging learning experiences that enhance spatial understanding, knowledge retention, and skill acquisition [2], [9], [14]. The superior knowledge retention observed in VR groups at follow-up assessments suggests these technologies may address the persistent challenge of knowledge decay in nursing education [2].

AI-enhanced pedagogies represent an emerging frontier, with potential for personalized learning, adaptive assessment, and sophisticated simulation [4], [6], [7]. However, rigorous comparative effectiveness studies remain limited, and important questions regarding AI accuracy, ethical implications, and the balance between technological efficiency and humanistic nursing values require ongoing attention [8].

Active learning strategies flipped classroom, PBL, and CBL demonstrated significant improvements in critical thinking and clinical reasoning, addressing longstanding concerns about passive learning in traditional nursing education [16], [18]. These approaches align with constructivist learning theories and prepare students for the complex, ambiguous clinical scenarios they will encounter in practice [12].

Student satisfaction was consistently higher with innovative pedagogies compared to traditional methods, with particularly high ratings for simulation, VR/AR, and gamification [1], [9], [21]. This finding has important implications for student engagement, motivation, and retention in nursing programs.

These findings align with and extend previous systematic reviews examining innovative nursing education pedagogies. A 2020 meta-analysis of simulation effectiveness reported similar effect sizes for clinical competence and critical thinking outcomes [33]. A 2021 review of VR in nursing education reported comparable student satisfaction ratings and knowledge retention benefits [34].

This review extends existing literature by providing contemporary evidence (2019-2026), examining a broader range of innovative strategies, and incorporating Indian nursing education perspectives. The inclusion of AI-enhanced pedagogies reflects emerging technological capabilities not examined in earlier reviews.

The finding that student satisfaction consistently exceeds faculty satisfaction with innovative technologies [1] aligns with technology acceptance literature, suggesting generational differences and the importance of faculty development in successful implementation.

Implications for Nursing Education

Curriculum development: Nursing curricula should integrate multiple innovative pedagogies strategically aligned with learning objectives and competency frameworks. Simulation should be systematically incorporated across the curriculum, progressing from simple to complex scenarios. VR/AR technologies should supplement traditional clinical experiences, particularly for high-risk, low-frequency scenarios. Active learning strategies should replace passive lectures where appropriate.

Faculty development: Comprehensive faculty development programs are essential for successful implementation of innovative pedagogies. Faculty require training in educational technologies, active learning facilitation, simulation debriefing, and assessment of complex competencies. Ongoing support, peer mentoring, and communities of practice can sustain faculty engagement and expertise development.

Infrastructure Investment: Institutions must invest in infrastructure supporting innovative pedagogies, including simulation centers, VR/AR equipment, learning management systems, and technical support. Partnerships with healthcare organizations, technology companies, and government agencies can facilitate resource acquisition.

Assessment transformation: Assessment methods must evolve to evaluate complex competencies developed through innovative pedagogies. Performance-based assessments, portfolios, simulation-based examinations, and competency-based progression models should complement traditional written examinations.

Pedagogical integration: Innovative strategies should be integrated thoughtfully, balancing technological innovation with humanistic nursing values. Technology should enhance, not replace, human interaction, clinical mentorship, and the development of caring, compassionate practitioners.

Indian Nursing Education Context

The National Nursing and Midwifery Commission Act (2023) provides a regulatory framework supporting adoption of innovative pedagogies through competency-based curriculum standards and quality assurance mechanisms [28], [29]. However, successful implementation requires addressing persistent challenges including faculty shortages, infrastructure deficits, and resource disparities between urban and rural institutions [12].

Government initiatives supporting simulation center development and e-learning infrastructure are positive steps [11]. However, sustained investment, faculty development programs, and context-appropriate implementation strategies are essential for equitable access to innovative pedagogies across India's diverse nursing education landscape [12].

Indian nursing education can learn from global implementation experiences while adapting strategies to local contexts, resources, and cultural values. Collaborative partnerships between Indian institutions and international nursing education leaders can facilitate knowledge exchange and capacity building [8], [11].

LIMITATIONS

This systematic review has several limitations that warrant consideration. First, the heterogeneity of study designs, interventions, and outcome measures across included studies precluded

quantitative meta-analysis, limiting the ability to generate pooled effect size estimates. Second, publication bias may favor studies reporting positive outcomes, potentially overestimating the effectiveness of innovative pedagogies. Third, many included studies employed small sample sizes (median $n=126$) and short follow-up periods, limiting generalizability and the ability to assess long-term retention and transfer of learning to clinical practice.

Fourth, few studies examined cost-effectiveness or return on investment for resource-intensive strategies such as VR/AR and high-fidelity simulation, limiting practical guidance for resource-constrained institutions. Fifth, implementation fidelity was rarely assessed, making it difficult to determine whether observed outcomes reflect the pedagogical strategy itself or the quality of implementation. Sixth, the quality of included studies varied, with some lacking rigorous control groups, randomization, or validated outcome measures.

Seventh, most studies examined single innovative strategies in isolation, providing limited evidence on optimal combinations or sequencing of multiple pedagogies. Eighth, contextual factors influencing implementation success—institutional culture, faculty expertise, student characteristics, and resource availability—were inconsistently reported, limiting understanding of transferability across settings. Finally, while this review included Indian perspectives, the limited number of rigorous studies from Indian contexts constrains the specificity of recommendations for Indian nursing education.

RECOMMENDATIONS FOR PRACTICE

For nursing education institutions: The findings of this review suggest that nursing institutions should adopt a strategic and systematic approach to integrating innovative pedagogies into nursing education by aligning teaching methods with curriculum competencies and intended learning outcomes. Institutions should invest in educational infrastructure, including simulation laboratories, virtual reality (VR), augmented reality (AR), and e-learning platforms, to create engaging and technology-enhanced learning environments. Comprehensive faculty development programs are essential to equip educators with the knowledge and skills required to effectively implement innovative teaching strategies, while communities of practice should be established to promote peer support, collaboration, and the exchange of best practices. The adoption of innovative pedagogies should follow a phased approach involving pilot testing, continuous evaluation, and iterative refinement to ensure successful implementation and sustainability. Additionally, assessment systems should be redesigned to evaluate higher-order competencies such as clinical reasoning, critical thinking, communication, and decision-making that are fostered through these pedagogical approaches. Finally, institutions should ensure equitable access to innovative learning opportunities so that all student cohorts can benefit from advancements in educational technologies and learner-centered teaching practices.

For faculty: Nurse educators should actively engage in continuous professional development to enhance their knowledge and skills in innovative pedagogies and emerging educational technologies. Collaboration with colleagues in the design, implementation, and evaluation of innovative teaching strategies can promote the sharing of expertise and best practices. Educators should strategically integrate multiple pedagogical approaches

based on specific learning objectives, student needs, and curriculum requirements while maintaining an appropriate balance between technological innovation and the humanistic values that underpin nursing practice. Regular evaluation of teaching effectiveness and student learning outcomes should be undertaken to ensure the quality and impact of educational interventions. Furthermore, educators should disseminate their experiences, best practices, and lessons learned through scholarly publications, conferences, and professional networks to contribute to the ongoing advancement of nursing education.

For policymakers: Policymakers and regulatory bodies should prioritize funding for the development of educational infrastructure, particularly in resource-limited institutions, to support the effective implementation of innovative pedagogies. They should also promote faculty development initiatives and provide incentives that encourage educational innovation and the adoption of evidence-based teaching practices. Establishing quality standards and guidelines for the use of innovative pedagogies, while allowing flexibility to accommodate institutional contexts and resources, can help ensure consistency and effectiveness across nursing education programs. Furthermore, partnerships between nursing education institutions and healthcare organizations should be strengthened to facilitate resource sharing, clinical collaboration, and experiential learning opportunities. Addressing faculty shortages through strategic recruitment, retention, and professional development initiatives is also essential to build a competent workforce capable of delivering high-quality, innovative nursing education.

For Indian nursing education: In the Indian context, the implementation of innovative pedagogies should be guided by the framework provided under the National Nursing and Midwifery Commission (NNMC) Act to ensure their systematic integration into nursing education. Context-specific implementation strategies should be developed to address challenges related to limited resources, infrastructure, and institutional capacity. Establishing regional simulation and technology centers that can serve multiple nursing institutions would optimize resource utilization and expand access to advanced learning facilities. National-level faculty development programs should be introduced to strengthen educators' competencies in innovative teaching methods and educational technologies. Additionally, fostering international collaborations can facilitate knowledge exchange, capacity building, and the adoption of global best practices in nursing education. Finally, implementation research should be encouraged to evaluate the effectiveness, feasibility, and scalability of innovative pedagogies within diverse Indian educational and healthcare settings, thereby generating evidence to inform future policy and practice.

CONCLUSION

This systematic review provides comprehensive evidence that innovative teaching strategies significantly enhance nursing education outcomes across critical domains including critical thinking, clinical competence, clinical decision-making, and student satisfaction. Simulation-based learning, VR/AR technologies, flipped classroom, and PBL/CBL demonstrate robust effectiveness compared to traditional lecture-based instruction. AI-enhanced pedagogies represent a promising emerging frontier requiring continued research and thoughtful implementation.

Successful adoption of innovative pedagogies requires strategic curriculum integration, infrastructure investment, comprehensive faculty development, and pedagogical approaches that balance technological innovation with humanistic nursing values. The National Nursing and Midwifery Commission Act provides a regulatory framework supporting innovation in Indian nursing education, though addressing persistent resource and capacity challenges remains essential.

As nursing education evolves to prepare future-ready practitioners capable of addressing complex healthcare challenges, promoting health equity, and leading healthcare transformation, innovative pedagogies will play an increasingly central role. The evidence synthesized in this review provides a foundation for

evidence-based decision-making by nursing education stakeholders globally and in India, supporting the development of competent, compassionate, and adaptable nurses prepared to meet the healthcare needs of diverse populations.

The future of nursing education lies not in wholesale replacement of traditional methods, but in thoughtful integration of innovative pedagogies that enhance learning, engagement, and competency development while preserving the humanistic values central to nursing practice. By embracing evidence-based innovation, investing in faculty development, and maintaining focus on preparing nurses who can provide excellent, equitable care, nursing education can fulfill its essential role in advancing health and well-being for all.

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