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Online Teaching Strategies for Nursing Students: Challenges and Opportunities

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Abstract

The COVID-19 pandemic has transformed global education systems, with nursing education being among the most affected disciplines due to its dual reliance on theoretical instruction and clinical practice. This study examines the challenges and opportunities associated with the accelerated adoption of online teaching for nursing students. Through a mixed-methods literature review published between 2020 and 2025, the paper highlights both the potential and the limitations of e-learning in nursing.

Key advantages of e-learning include accessibility, flexibility, and innovation which enable continuity of learning regardless of geographical location or time constraints. The integration of digital tools, such as virtual patient simulations and online case studies, has provided innovative opportunities to strengthen both theoretical and clinical knowledge. Nevertheless, there're significant reductions in opportunities for direct clinical practice, unequal access to digital resources, and diminished interpersonal interaction.

The findings suggest that blended learning an-approach combining online education with supervised, clinical training-offers the most effective and sustainable model for nursing education in the post-pandemic era. Recommendations include expanding investment in digital infrastructure, incorporating high-quality simulation technologies into nursing curricula, and ensuring comprehensive faculty development in e-learning pedagogies. Ultimately, online learning should be

regarded not as a replacement but as a complementary strategy that enhances traditional nursing education.

Keywords: online teaching, nursing education, virtual simulation, blended learning, clinical skills.

1. Introduction

The onset of the COVID-19 pandemic in 2020 created unprecedented disruptions in global education, forcing universities and colleges worldwide to adopt online teaching models. While many academic disciplines were able to make a relatively smooth transition, nursing education faced unique challenges due to its reliance on both theoretical knowledge and clinical practice (Nuuyoma et al., 2023; Alfaleh et al., 2023). Nursing students not only require exposure to academic content but also to direct patient care experiences, supervised clinical practice, and the development of professional communication skills.

2. Literature Review

The sudden shift to online platforms tested the resilience of nursing schools, faculty members, and students alike. For many, this transition highlighted the transformative potential of technology in education, but it also revealed systemic inequalities and pedagogical limitations (Chambers & Whitfield, 2025; Pozzi et al., 2023; Sutoi et al., 2023). Romania was compelled to redesign its nursing curricula almost, relying heavily on digital tools, infrastructure and the pedagogical level of teachers in different regions (Alfaleh et al., 2023). At the same time, other nations demonstrated both positive outcomes and significant shortcomings of this rapid digitalization process (Mojarad et al., 2023; Kumar et al., 2021; Falahati-Marvast et al., 2025).

This review contributes to highlighting the effectiveness of incorporating online learning into traditional nursing education. Virtual simulation technologies have emerged as effective strategies to enhance communication, problem-solving, professional competence, and nursing process application, but attention needs to be paid to equitable access to technology, instructor competence, and blended models that align with the digital transformation of healthcare and patient-centered

nursing (Alsharari et al., 2025; Hara et al., 2021; Du et al., 2022; Păstae, 2023). The study draws on a mixed-methods literature review published between 2020 and 2025, highlighting trends, benefits, challenges, and future recommendations.

Objectives

The primary objective of this study is to examine the opportunities and barriers associated with online teaching in nursing education. Specifically, the study aims to:

1. identify the benefits of online teaching for nursing students, particularly in terms of accessibility, flexibility, and innovation.
2. explore the barriers and limitations, including challenges related to student engagement, digital infrastructure, and e-learning pedagogies.
3. propose recommendations for implementing blended learning models that balance theoretical instruction with clinical practice.

3. Methodology

Study design

This paper is based on a mixed-methods literature review published from 2020 to 2025. The following electronic databases were searched: PubMed, Scopus, CINAHL, ERIC, and Web of Science. The search terms included: online teaching, nursing education, virtual simulation, blended learning, and clinical skills were conducted following the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al., 2021; Liberati et al., 2009).

The synthesis and integration of findings across diverse study designs were conducted following the Joanna Briggs Institute (JBI) Convergent Integrated Approach (Lizarondo et al., 2020). This approach facilitates the integration of qualitative and quantitative evidence within a single synthesis by transforming data into a compatible format and developing unified, overarching themes. The convergent integrated method ensures that both qualitative insights and quantitative

outcomes contribute equally to the interpretation of results, thereby providing a more comprehensive understanding of the research phenomenon.

In parallel, the methodological guidance of Bettany-Saltikov & McSherry (2016) was applied to ensure the rigor of systematic searching, critical appraisal, and evidence management within a mixed-methods review framework. This combined approach enabled the systematic inclusion, evaluation, and synthesis of multiple forms of evidence while maintaining transparency and methodological consistency throughout the review process. Additionally, the integration of these two frameworks strengthened the credibility of the synthesis and facilitated the development of evidence-based, contextually grounded recommendations derived from the full spectrum of available research.

Eligibility criteria

This study followed the Joanna Briggs Institute (JBI) Methodology for Systematic Reviews. The PICo framework which defines the Population, Phenomena of Interest, and Context was used as the basis for systematically identifying and selecting both qualitative and quantitative studies, as well as for establishing the inclusion and exclusion criteria (Stern et al., 2020).

Inclusion criteria: peer-reviewed studies published between 2020 and 2025, studies focusing on nursing students or nurses engaged in online learning, and both qualitative and quantitative research designs.

Exclusion criteria: non-English publications, studies without empirical data, and research focusing on non-nursing health professions. Additionally, the eligibility criteria were conducted following **Table 1**.

Inclusion criteria	Exclusion criteria
Peer-reviewed studies published between 2020- 2025	Not peer-reviewed studies published between 2020- 2025
Studies focusing on nursing students or nurses engaged in online learning	Research focusing on non-nursing health professions
English publications, empirical studies	Non-English publications, studies without empirical data
Qualitative or quantitative research designs and both.	Not qualitative or quantitative research designs and neither.

Table 1. Eligibility criteria

Study strategy: This systematic search was conducted across PubMed, Scopus, CINAHL, ERIC, and the Web of Science databases. The reference lists of all articles were searched for additional studies. Studies published in English from 2020 to 2025 were searched to identify relevant articles on e-learning and nursing students. This research period spans the Covid-19 period to the present, when online learning has become an important element in the international teaching and learning landscape. The initial keywords used in the review were "nursing education" OR "clinical skills"; "online teaching" OR "virtual simulation, OR "blended learning". The complete search strategy implemented is presented in **Table 2** of Supplement appendix.

Study selection: This paper applied inclusion and exclusion criteria throughout the selection process. After removing duplicates, the titles and abstracts of the remaining articles were screened to exclude irrelevant studies. At this stage, 53 articles were identified as potentially eligible and underwent full-text review according to the pre-defined inclusion and exclusion criteria. After full-text screening, 12 primary research articles met the eligibility criteria and were included in the initial review synthesis. The selection process, including the reasons for exclusion at each stage, is detailed in the PRISMA 2020 flowchart (Page et al., 2021). The PRISMA flowchart for the initial search are available in **Figure 1**.

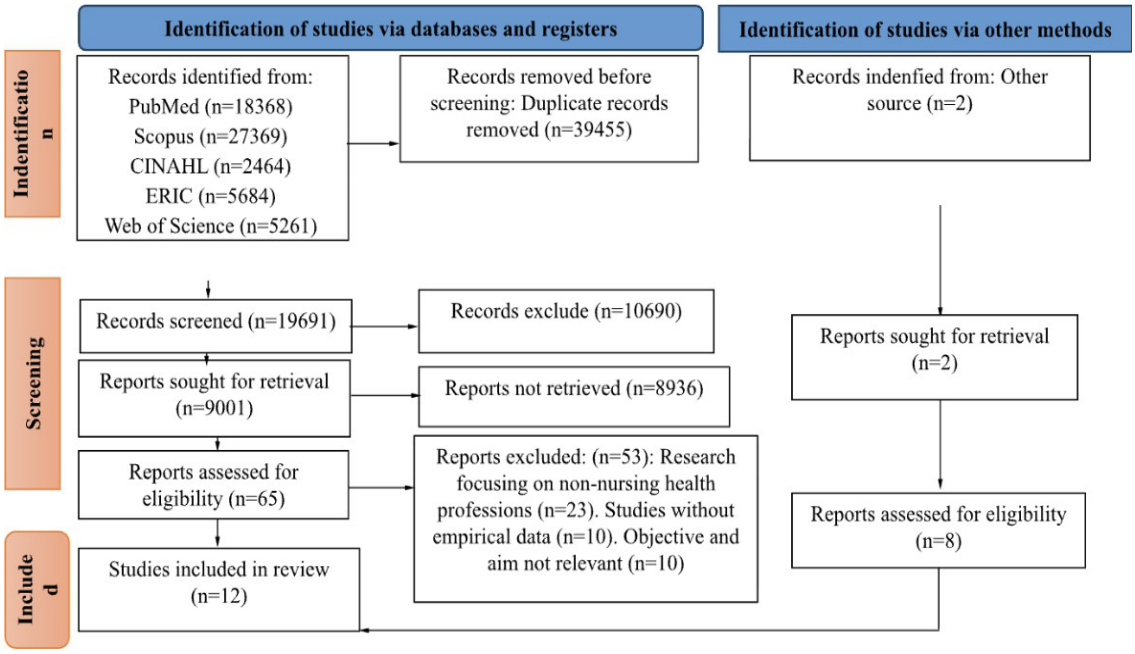

Figure 1. Preferred Reporting Items for Systematic reviews (PRISMA) (Page et al., 2021)

Quality assessment

For Randomised Controlled Trials (RCTs), the quality appraisal was conducted using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Randomised Controlled Trials (JBI, 2020) and specify the criteria or scoring system applied in this study.

Assessing the Quality of 12 articles involves the following five specific steps: 1) Scoring and Classification: The total score is calculated by counting the number of "Yes" responses. Commonly accepted classification thresholds are: 11–13 = High quality, 8–10 = Medium quality, and ≤7 = Low quality. 2) Addressing "Unclear" or Missing Information: State the reason for the "Unclear" rating in the "Notes" column (e.g., the randomization method was not described). Do not automatically mark "No" if the information may be located elsewhere in the article—check the appendix or supplementary material first. If it is still not found, keep the "Unclear" label. 3) Impact on Overall Evidence: Considers conducting sensitivity analyses, excluding low-quality studies to test the robustness of the results. 4) Transparent Presentation: Include the full assessment table in the **Appendix** and summarize the quality findings in the Methods or Results

section. Report the number of studies in each quality category, the most common weaknesses, and their potential impact on the overall conclusions. 5) Practice Recommendations: If there are a number of studies scoring low on key criteria, caution should be exercised when interpreting the findings, and future studies should be recommended using more rigorous designs. Quality assessment based on 12 studies of the systematic review in **Table 3** of Supplement appendix.

The quality assessment of 12 randomized controlled trials (RCTs) using the Joanna Briggs Institute (JBI) Checklist found that most studies were of moderate to high methodological quality. Overall strengths included clear randomization procedures, reliable outcome measures, and appropriate statistical analysis. However, some limitations remained regarding blinding of participants, adequacy of follow-up, and transparency of reporting. Overall, five studies were classified as high quality (scores 11-13), while the remaining seven were of moderate quality (scores 8-10). No studies of low quality were identified, suggesting that the included RCTs provided a solid evidence base for synthesis.

Data extraction

This paper conducted data extraction using a standardized template developed in accordance with the guidelines by Stern et al. (2020). This template was created in Microsoft Word (2019) to facilitate systematic extraction and ensure consistency across all included studies. Data items included the general characteristics of each study (author(s), publication year, study aim, sample, and research design), participant demographics (gender, age, years of experience), data collection tools (instruments used, components relevant, and data analysis techniques), and the findings. A digital reflective record was maintained to document decisions, uncertainties, and reasons for inclusion or exclusion. All extracted data were compiled into a summary of extracted data **Table 4** in Supplement appendix, which was then used to support thematic synthesis and integration of findings.

Data analysis and synthesis

A thematic narrative synthesis was conducted to summarize the challenges and opportunities of online teaching on nurses' learning, following the Guidelines for Conducting a Narrative

Synthesis in a Systematic Review (Popay et al., 2006). The thematic analysis followed the six steps outlined by Braun and Clarke (2006): familiarization with the data, initial coding, theme identification, theme review, definition, and naming. The synthesis was structured around the research objectives of the study outlined above.

Data were synthesized using the Joanna Briggs Institute (JBI) convergent integration method to integrate qualitative and quantitative findings (Lizarondo et al., 2020). In this method, quantitative findings are qualified, where data are converted into textual descriptions, to facilitate thematic integration with qualitative data. Although this method allows for comprehensive thematic synthesis, it also requires subjective interpretation of numerical findings, leading to the possibility of bias in interpretation. Therefore, to minimize this risk, the process was guided by Sandelowski et al. (2006), which aims to avoid the possibility of misinterpretation due to assigning numerical values to narrative data.

After data transformation, an inductive process by Thomas & Harden (2008), which three-stage thematic synthesis method, was applied to analyze the data in the synthesized study findings. In the first stage, initial codes were generated from all study findings through line-by-line text coding. This process was manually recorded and organized using Microsoft Word (2019). In the second stage, codes were grouped into descriptive categories based on patterns and similarities within and between studies. The third stage involved interpreting these categories to generate analytical themes that captured commonalities and differences between the studies reviewed. Codes and themes were reviewed multiple times to ensure consistency, coherence, and relevance to the review question. Preliminary themes and their supporting data were reviewed to ensure coherence, clarity, and relevance to the review objectives.

4. Results

Characteristics of the included studies

Two studies used qualitative methods (Mojarad et al., 2023; Nuuyoma et al., 2023). Two studies used quantitative methods (Kumar et al., 2021; Sutoi et al., 2023). Five studies used mixed

methods (Alsharari et al., 2025; Chambers & Whitfield, 2025; Du et al., 2022; Păstae, 2023; Pozzi et al., 2023). One study pretest–posttest controlled trial/experimental study (Falahati-Marvast et al., 2025). One study cross-sectional, multicentric study (Alfaleh et al., 2023). Methodological study/descriptive study (Hara et al., 2021). The selected studies were conducted in Saudi Arabia (n = 1), England (n = 1), China (n = 1), Iran (n = 2), Brazil (n = 1), India (n = 1), Namibia (n = 1), Italy (n = 1), Australia (n = 1), and Romania (n = 2). The main characteristics of each paper are summarised in **Table 4** of Supplement appendix.

Integrated findings

The thematic analysis identified three main themes related to online teaching for nursing students in education: the main benefits, barriers, and recommendations. Each theme included one or more subthemes that highlighted specific aspects of advantages, limitations, and future recommendations for online teaching. A summary of the themes, categories, and related subthemes are presented in a thematic map (**Figure 2**).

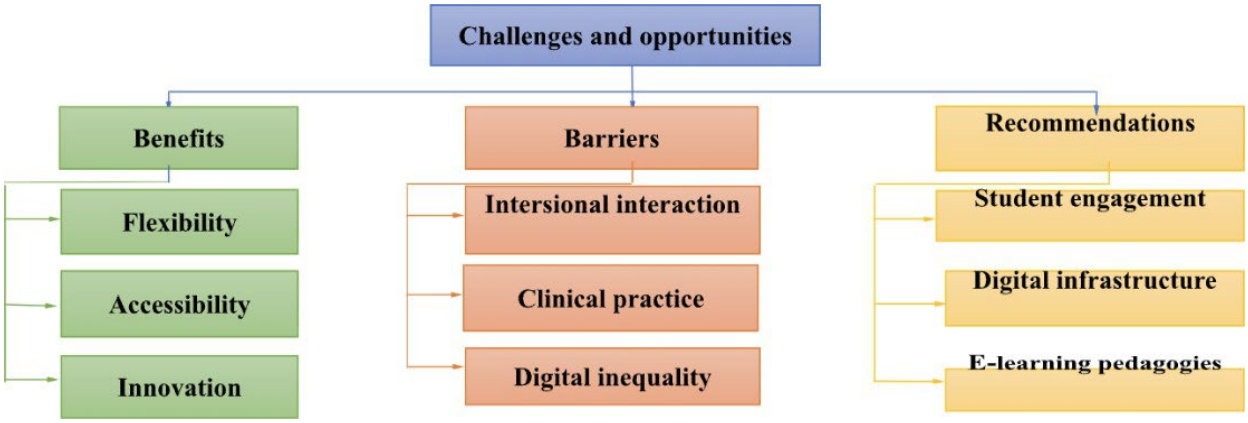

Figure 2. Thematic map of the benefits, barriers, and proposed recommendations for e-learning

Synthesis of Findings

Benefits

Across the analysis of 12 articles, three main benefits of the effectiveness of online teaching for nursing students were found: accessibility, flexibility, and innovation. Each advantage has many aspects that are described in detail in each article.

The general consensus highlights that online and blended teaching have become integral and effective components of modern nursing education. Studies consistently reported that virtual platforms supported continuity of learning during the COVID-19 pandemic, ensuring academic progression even amid institutional closures. It still ensures flexibility, convenience, accessibility of learning materials, and time efficiency (Pozzi et al., 2023; Alfaleh et al., 2023; Kumar et al., 2021).

The primary advantage reported across studies was flexibility; students could learn anytime, anywhere, allowing for personalized pacing. Online platforms enhanced accessibility, particularly for remote learners and those balancing study with employment (Chambers & Whitfield, 2025).

Quantitative findings (Kumar et al., 2021; Sutoi et al., 2023) showed that most nursing students expressed high satisfaction with online learning. They rated online learning as generally effective and considered it a valuable educational approach. Online learning is not a replacement but a complement to traditional teaching methods, and it accommodates innovation and adaptation.

Qualitative findings (Mojarad et al., 2023; Nuuyoma et al., 2023) support the appreciation of flexibility and accessibility. These reviews have impressed virtual simulation such as LMS, online case study, video conferencing, forums, and social media. The technologies have emerged as effective strategies, enhancing communication, problem-solving, innovative skills, professional competence, and nursing process application.

Meta-analysis and mixed-methods underscore the importance of inclusive, flexible, and human-centered e-learning strategies in nursing education. Additionally, the review found that blended learning is more effective than traditional teaching in enhancing nursing students' knowledge, skills, and satisfaction. (Chambers & Whitfield, 2025; Du et al., 2022).

Technological tools such as virtual reality simulations, serious games, and e-learning modules created safe, interactive environments for students to practice without risking patient safety. The

technology has the potential to bridge the gap between theoretical training and real patient interactions. Furthermore, these tools improved student engagement, confidence in theoretical concepts, and readiness for evidence-based practice. Additionally, the virtual simulations, realistic games, and interactive modules enhance nursing students' clinical reasoning, communication, and creativity skills. Overall, the results suggest that blended learning models outperform online or face-to-face learning formats, achieving a balanced integration of digital and practical competencies. Ultimately, these studies were showed significant improvements in theoretical knowledge, problem-solving ability, and critical thinking in students exposed to virtual simulation or blended e-learning environments (Alsharari et al., 2025; Hara et al., 2021; Falahati-Marvast et al., 2025).

In Romania, these studies concluded that online teaching was generally effective, with students perceiving it as a valuable educational approach. The stronger pre-pandemic digital strategies fared better in ensuring continuity of nursing education. Online learning offers several benefits, including flexibility, accessibility, and time efficiency (Alfaleh et al., 2023; Sutoi et al., 2023).

Other benefits included cost savings, efficient use of teaching resources, and the ability to record and revisit lectures. Some studies also reported that online learning fostered self-directed learning, reflective thinking, and digital literacy-essential competencies for future healthcare professionals (Chambers & Whitfield, 2025; Pozzi et al., 2023).

Barriers

Despite the advantages, all studies acknowledged persistent challenges that hindered the full potential of online nursing education. The most frequent issues included challenges related to student engagement, digital infrastructure, and e-learning pedagogies.

E-learning was the only viable solution during the COVID-19 pandemic, but it posed significant challenges in resource-constrained settings when introduced abruptly. The findings emphasize the need for structured support systems, better training, and innovative methods to address practical, assessment, and digital literacy challenges (Nuuyoma et al., 2023). Lack of clinical practice opportunities (Sutoi et al., 2023; Du et al., 2022), which reduced the development of

psychomotor and interpersonal skills. Technological barriers, including poor internet connectivity, limited access to devices, and inadequate IT support (Mojarad et al., 2023). In addition, the barriers included poor voice clarity, connectivity issues, and physical strain (eye problems), negatively influenced the experience (Kumar et al., 2021). Reduced interaction between students and instructors, leading to isolation, lower motivation, and diminished sense of community. Inexperienced educators, some of whom lacked training in digital pedagogy, were affecting the quality and engagement of e-learning sessions. The review reveals that while online collaboration is increasingly recognized as valuable for nursing education, its actual implementation often falls short of best pedagogical practices (Păstae, 2023).

The digital inequality between urban and rural learners exacerbated existing educational disparities. In Romania, the transition to online learning exposed gaps in digital infrastructure, especially in rural areas where connectivity was weak. Faculty members were often unprepared for digital teaching, lacking both technological skills and pedagogical training for online platforms (Sutoi et al., 2023).

Additionally, this study has certain limitations. First, the systematic review was restricted to English-language publications, which may have excluded valuable evidence from non-English-speaking countries. Second, the included studies were heterogeneous in design, making direct comparisons difficult. Finally, the review did not assess long-term outcomes of online learning, leaving questions about its sustained effectiveness unanswered.

Recommendations

All authors agreed that blended learning should become the standard pedagogical model for nursing education. Recommendations for e-learning in nursing education emphasized:

Institutional investment in digital infrastructure to ensure reliable internet access and modern learning management systems. Faculty development programs focused on digital teaching competencies, instructional design, and virtual assessment strategies. Integration of virtual simulations, 3D serious games, and case-based e-learning as supplements to real clinical practice. Ongoing evaluation and quality assurance to align digital education with nursing

accreditation standards. Encouraging student-centered approaches that balance autonomy with interactive, collaborative learning environments.

Furthermore, a recurring theme was the need for policy-level reform to formally recognize e-learning components in nursing curricula and to fund innovation in simulation-based and hybrid teaching methodologies. Ultimately, longitudinal studies are needed to assess the long-term impact of e-learning on nursing competencies and patient outcomes.

5. Conclusion

The findings suggest that online education has become an essential component of nursing education, particularly in times of crisis. Its greatest strength lies in its flexibility, accessbility, and innovation which enables uninterrupted learning during disruptions such as pandemics. Additionally, the use of digital simulations and case studies can enhance clinical reasoning skills and provide exposure to diverse clinical scenarios.

However, online education has clear limitations when applied exclusively to nursing. The absence of hands-on clinical training remains the most pressing concern. Nursing is inherently practical, requiring students to develop not only cognitive but also psychomotor and affective skills through direct patient interactions. Without supervised clinical practice, students risk graduating with incomplete competencies.

Another important issue is digital inequality**.** Students from low-income backgrounds or rural regions often lack access to stable internet connections and suitable devices, leading to disparities in learning opportunities. Furthermore, the reduction in face-to-face interaction can weaken peer collaboration and limit the development of soft skills such as empathy and teamwork.

From a Romanian perspective, the integration of online learning into nursing education must align with the broader goals of the European Higher Education Area (EHEA), which emphasizes inclusivity, digital innovation, and quality assurance. Investment in infrastructure and faculty training is therefore critical to bridging the gap between policy and practice.

In conclusion, online teaching has emerged as both a challenge and an opportunity for nursing education. While it has ensured continuity of learning during the COVID-19 pandemic, its limitations underscore the need for a hybrid approach. Blended learning, combining online theory with face-to-face clinical practice, offers the most sustainable and effective pathway forward. The study concludes that e-learning should not be viewed as a replacement for traditional nursing education but rather as a complementary tool that can enrich teaching, enhance accessibility, and prepare students for the realities of an increasingly digital healthcare environment.

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Supplement Appendix of the Paper:

Online Teaching Strategies for Nursing Students: Challenges and Opportunities

Database	Search terms
PubMed n=18368	1, nursing education,,"in the last 5 years, Full text, English","(""education, nursing""[MeSH Terms] OR (""education""[All Fields] AND ""nursing""[All Fields]) OR ""nursing education""[All Fields] OR (""nursing""[All Fields] AND ""education""[All Fields])) 2, nursing education,,"in the last 5 years, Full text, English","(""education, nursing""[MeSH Terms] OR (""education""[All Fields] AND ""nursing""[All Fields]) OR ""nursing education""[All Fields] OR (""nursing""[All Fields] AND ""education""[All Fields])) AND ((y_5[Filter]) AND (fft[Filter]) AND (english[Filter]))","62,253",10:31:00,2025/10/04 3, virtual simulation,,"in the last 5 years, Full text, English","((""virtual""[All Fields] OR ""virtuality""[All Fields] OR ""virtualization""[All Fields] OR ""virtualized""[All Fields] OR ""virtualizing""[All Fields] OR ""virtuals""[All Fields]) AND (""computer simulation""[MeSH Terms] OR (""computer""[All Fields] AND ""simulation""[All Fields]) OR ""computer simulation""[All Fields] OR ""simulation""[All Fields] OR ""simul""[All Fields] OR ""simulate composite resin""[Supplementary Concept] OR ""simulate composite resin""[All Fields] OR ""simulate""[All Fields] OR ""simulated""[All Fields] OR ""simulating""[All Fields] OR ""simulates""[All Fields] OR ""simulation s""[All Fields] OR ""simulational""[All Fields] OR ""simulations""[All Fields] OR ""simulative""[All Fields] OR ""simulator""[All Fields] OR ""simulator s""[All Fields] OR ""simulators""[All Fields])) AND ((y_5[Filter]) AND (fft[Filter]) AND (english[Filter]))","20,156",10:31:49,2025/10/04 4, blended learning,,"in the last 5 years, Full text, English","((""blend""[All Fields] OR ""blend s""[All Fields] OR ""blended""[All Fields] OR ""blending""[All Fields] OR ""blends""[All Fields]) AND (""learning""[MeSH Terms] OR ""learning""[All Fields] OR ""learn""[All Fields] OR ""learned""[All Fields] OR ""learning s""[All Fields] OR ""learnings""[All Fields] OR ""learns""[All Fields])) AND ((y_5[Filter]) AND (fft[Filter]) AND (english[Filter]))","2,646",10:32:30,2025/10/04 5, clinical skills,,"in the last 5 years, Full text, English","(""clinical competence""[MeSH Terms] OR (""clinical""[All Fields] AND ""competence""[All Fields]) OR ""clinical competence""[All Fields] OR (""clinical""[All Fields] AND ""skills""[All Fields]) OR ""clinical skills""[All Fields]) AND ((y_5[Filter]) AND (fft[Filter]) AND (english[Filter]))","50,001",10:40:33,2025/10/04
	1. TITLE-ABS-KEY (online teaching) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (DOCTYPE , "ar"))

Database	Search terms
Scopus n=27369	AND (LIMIT-TO (EXACTKEYWORD , "E-learning")) 2. TITLE-ABS-KEY (nursing education) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "NURS")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Nursing Education")) AND (LIMIT-TO (LANGUAGE , "English")) 3. TITLE-ABS-KEY (virtural simulation) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE , "English")) 4. TITLE-ABS-KEY (blended learning) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Blended Learning")) AND (LIMIT-TO (LANGUAGE , "English")) 5. TITLE-ABS-KEY (clinical skills) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SUBJAREA , "NURS")) AND (LIMIT-TO (EXACTKEYWORD , "Article")) Filters applied: article, 5 years, English.
CINAHL (EBSCO host) n=2464	(online teaching OR clinical skills OR blended learning OR virtural simulation OR nursing education) AND (clinical skills OR blended learning OR virtural simulation OR nursing education OR online teaching)
ERIC n=5684	https://eric.ed.gov/?q=online+teaching&ft=on&ff1=dtySince_2021 https://eric.ed.gov/?q=nursing+education&ft=on&ff1=dtySince_2021 https://eric.ed.gov/?q=virtual+simulation&ft=on https://eric.ed.gov/?q=blended+learning&ft=on https://eric.ed.gov/?q=clinical+skills&ft=on&ff1=dtySince_2021
	https://mjl.clarivate.com://search-results?issn=2626-8493,2322-1291,1741-7627,2146-1732,1492-1154,1755-2273,1410-7201,2472-5749,2083-5205,2167-4779&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-these-results

Database	Search terms
Web of Science n=5261	https://mjl.clarivate.com://search-results?issn=2194-5772,0148-4834,1536-5026,0260-6917,1471-5953,0363-3624,0022-0124,1976-1317,2528-181X,2687-6442&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-these-results https://mjl.clarivate.com://search-results?issn=1687-5591,2213-7467,2059-0628,2673-4192,1460-7425,2188-5303,1049-3301,1996-3599,1876-1399,1007-5704&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-these-results https://mjl.clarivate.com://search-results?issn=1941-8647,1479-4403,1443-1394,2000-7426,1541-5015,2538-1032,1492-3831,1835-5196,2146-1732,1929-7750&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-these-results https://mjl.clarivate.com://search-results?issn=1940-0640,1899-5276,1594-0667,2993-7175,1710-1492,2352-8737,2330-1910,1175-0561,0002-9157,0002-9165&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-these-results

Table 2. Search strategies for electronic databases

JBI Critical Appraisal Checklist for Randomised controlled Trials (RCT) by Joanna Briggs Institue, 2020.															
No.	Article (Author, Year)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Total Score	Quality Level
1	Alsharari, A. F., et al. (2025)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12	High

JBI Critical Appraisal Checklist for Randomised controlled Trials (RCT) by Joanna Briggs Institue, 2020.																
2	Chambers, A & Whitfield, C. (2025)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	11	High
3	Du, L., et al. (2022)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10	Moderate
4	Falahati-Marvast F., et al. (2025)	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	9	Moderate
5	Hara, C. Y. N., et al. (2021)	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	8	Moderate
6	Kumar A., et al. (2021)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12	High
7	Mojarad, F. A., et al. (2023)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	11	High
8	Nuuyoma V., et al. (2023)	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	9	Moderate
9	Oana-Maria Păstae (2023)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	10	Moderate

JBI Critical Appraisal Checklist for Randomised controlled Trials (RCT) by Joanna Briggs Institue, 2020.																
10	Pozzi, F., et al. (2023)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	12	High
11	Alfaleh, R., et al. (2023)	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	8	Moderate
12	Sutoi, D., et al. (2023)	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	9	Moderate

Table 3. JBI Critical Appraisal Checklist for Randomised controlled Trials (RCT) inclued in the study

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
1	Alsharari, A. F., et al. (2025), Saudi Arabia	Systematic review following PRISMA guidelines.	To evaluate the effectiveness of virtual simulation technologies in improving nursing students' communication, problem-solving ability, professional competen	12 primary studies, with 928 nursing students (mean age 19–23).	Experimental studies (RCTs and quasi-experimental with pre/post-tests).	Nursing students and e-simulation technologies.	PEDro scale for quality assessment; effect sizes calculated (small 0.1–0.3, moderate 0.3–0.5, large >0.5).	Problem solving: 5 studies reported small–large improvements (effect size −0.2 to 0.9). Confidence and decision-making processes improved. Communication: Virtual simulation improved communication with patients, peers, and healthcare professionals (effect size 0.4–0.9). Core professional competencies: 4 studies showed improvements in clinical competence (effect size 0.3–0.9). Nursing process: Moderate improvements in assessment, diagnosis, planning, intervention, and evaluation phases (effect size 0.2–0.8). Documentation and patient education showed strong gains. Overall: E-learning posed significant challenges for nursing students, particularly in clinical training, assessment, infrastructure, and psychosocial well-being. Virtual simulation technologies have emerged as effective strategies to overcome many of these barriers, enhancing communication, problem-solving, professional competencies, and application of the nursing process. While evidence supports their integration into curricula, attention must be paid to equitable access,

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			cies, and application of the nursing process.					rigorous evaluation, and blended models that align with nursing's practical, patient-centered nature.
2	Chambers, A & Whitfield, C. (2025, England	Systematic review following PRISMA guidelines.	To explore and analyze the factors that affect postgraduate nursing students' engagement with online learning environments in higher education, and to	Fifteen studies met inclusion criteria, spanning several countries (Canada, USA, UK, Japan, Australia, South Africa,	Mixed Methods Appraisal Tool (MMAT).	Postgraduate nursing students' engagement with online learning environments.	Data were extracted and thematically analyzed using an inductive synthesis framework.	Seven major themes emerged: 1. Convenience – increased flexibility but also competing demands. 2. Curriculum design – structure and pacing influenced satisfaction. 3. Educator presence – enhanced motivation and reduced isolation. 4. Social interaction – peer collaboration supported engagement. 5. Technology issues – infrastructure and digital literacy as barriers. 6. Independent learning – encouraged autonomy but risked isolation. 7. Working with peers – collaboration sometimes caused conflict. Overall, engagement depended on balancing autonomy, educator guidance, and effective technology use. Postgraduate nurses' engagement with online learning is influenced by multiple, interdependent factors. Effective

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			identify enablers and barriers to active participation and learning effectiveness.	Philippines, Turkey, Taiwan, Norway).				engagement requires a balance between independence and instructor support, strong course design, and opportunities for interaction. Investment in digital infrastructure and training for educators is critical. The review underscores the importance of inclusive, flexible, and human-centered e-learning strategies in postgraduate nursing education.
3	Du, L., et al. (2022). China	Systematic review and meta-analysis (PRISMA guidelines).	To determine whether blended learning is more effective than traditional teaching in nursing education.	25 studies (13 RCTs and 12 quasi-experiments, 2706 nursing students.	Cochrane risk-of-bias tool, MINORS, Review Manager 5.2, and Stata 14.0 for meta-analysis.	Studies on nursing students comparing blended learning.	Publication bias check: Egger's test. Sensitivity and subgroup analyses performed.	Knowledge: Blended learning significantly improved knowledge (SMD=0.64, p=0.001). Skills: Improved skill performance (SMD=0.37, p=0.010). Learning satisfaction: Increased student satisfaction (SMD=0.32, p=0.019). No significant publication bias detected. Heterogeneity: High across studies; factors like study design, sample size, intervention length, and number of blended learning components may influence results. Blended learning is more effective than traditional teaching in enhancing nursing students' knowledge, skills, and satisfaction. Despite requiring initial investment in technology and course design, it shows strong long-term potential to improve

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
								professional competence and optimize nursing education resources.
4	Falahati-Marvast F., et al. (2025). Iran	Pretest –posttest controlled trial.	To determine whether an asynchronous virtual training program can effectively enhance nursing students' intentions to engage in the Evidence-Based Practice	79 nursing students.	Intentions to Engage in the EBP Process scale (Rubin & Parrish, 2010; Persian validated version, α = 0.75).	Nursing students' intentions to engage in the Evidence-Based Practice (EBP) process.	SPSS 21; descriptive statistics, independent and paired t-tests, chi-square, ANCOVA ($p \leq 0.05$).	Pre-intervention: No significant difference between groups ($p = 0.15$). Post-intervention: Significant increase in intention scores for the intervention group ($M = 44.62 \pm 3.67$) vs. control ($M = 36.56 \pm 3.53$; $p = 0.03$). Within-group analysis: Intervention group improved significantly ($p = 0.02$), while control group showed no significant change ($p = 0.06$). Covariate analysis: Demographic factors did not significantly affect EBP intention ($p > 0.05$). The study confirmed that structured virtual training can effectively enhance nursing students' intentions to engage in evidence-based practice. Integrating EBP-focused online modules into nursing curricula can strengthen students' readiness for evidence-based clinical decision-making and bridge the gap between research and practice.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			(EBP) process.					
5	Hara, C. Y. N., et al. (2021). Brazil	Methodological study.	The primary objective was to design, develop, and evaluate a 3D VR serious game (Comunica-Enf) aimed at improving communication skills among nursing students and	13 nursing professors and 30 undergraduate nursing students.	(VR) tool using Oculus Rift® , Heuristic Evaluation for Digital Educational Games (HEDEG).	Participants used the game and then completed the Heuristic Evaluation for Digital Educational Games (HEDEG).	Problems classified from 0 (no impairment) to 4 (urgent priority). Validation was achieved if <25% of problems were type 3–4.	None of the heuristics exceeded the 25% threshold for severe problems. Both professors and students judged the game as suitable for nursing education. Suggestions were provided, including improving avatar facial expressions, adding patient voice feedback, and adjusting usability for players wearing prescription glasses. The VR immersion provided safe, realistic, and motivating environments that supported communication learning. Comunica-Enf was validated in terms of appearance and usability. It provides a safe and engaging platform for students to practice communication skills before clinical placements. The technology has potential to bridge the gap between theoretical training and real patient interactions. However, ongoing improvements such as artificial intelligence integration and voice interaction are recommended to enhance realism.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			ensuring patient safety before real-life clinical practice.					
6	Kumar A., et al. (2021). India	Quantitative, cross-sectional survey.	To assess nursing students' satisfaction with online learning during the COVID-19 pandemic and to identify the main barriers hindering	219 nursing students.	Web-based survey (Google Forms) using a self-structured, validated questionnaire.	Nursing students' satisfaction with online learning.	Descriptive and inferential statistics with SPSS v20.	Satisfaction: 67.57% of students were *extremely satisfied*; 32.42% were satisfied. No students reported dissatisfaction. Barriers: Administrative: Low voice/language clarity (highest ranked), large class size. Individual: Eye strain (highest), lack of communication with instructors, lack of support. Technological: Connectivity issues (highest), unmotivating online environment. Demographics: Age was significantly associated with satisfaction; other demographics were not. Most students expressed high satisfaction with online learning. However, barriers such as poor voice clarity, connectivity issues, and physical strain (eye problems) negatively influenced the experience.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			effective participation.					
7	Mojarad, F. A., et al. (2023). Iran	Qualitative study, conventional content analysis (Graneheim & Lundman framework).	To identify and analyze the challenges and facilitators of e-learning in nursing education during the COVID-19 pandemic from the perspectives of students,	16 individuals (8 nursing students, 6 faculty, 2 staff).	Semi-structured interviews (30–50 minutes), November 2020–February 2021.	The challenges and facilitators of e-learning in nursing education.	Coding and thematic categorization of transcripts into subthemes and categories. Trustworthiness: Triangulation, member checking, expert review, verbatim transcription.	1. Challenges of e-learning Inexperienced teachers (lack of digital skills, poor scheduling, minimal use of platforms). Ineffective learning (poor interaction, language issues, teacher-centered approaches). Academic cheating (copying assignments, group cheating in exams). System problems (poor internet access, limited devices, software issues). Inappropriate evaluation (low credibility, lack of feedback, unrealistic assessments). 2. Facilitators of e-learning Improving education (teacher training, blended methods, interactive sessions, student encouragement). Promoting online exams (better infrastructure, standardized testing, randomization of questions). E-learning became essential during the pandemic but faced serious barriers in terms of teacher readiness, infrastructure, and evaluation credibility. However, effective strategies such as teacher training, technological investment, and improved exam

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			teachers, and staff.					integrity can make e-learning a sustainable supplement to traditional nursing education.
8	Nuuyoma V., et al. (2023). Namibia	Qualitative exploratory and contextual study.	To explore and describe the challenges faced by university nursing students regarding e-learning during the early stages of the COVID-19 pandemic, particularly in a	17 fourth-year nursing students.	Two focus groups and five individual interviews.	The challenges faced by university nursing students.	Qualitative content analysis following Bengtsson's framework. Trustworthiness: Ensured through credibility, dependability, confirmability, and transferability.	Five main categories of challenges emerged: 1. E-learning unsuitable for practical components – inability to conduct clinical and hands-on training online. 2. Assessment-related challenges – time pressure, difficulty typing and thinking simultaneously, lack of supervision, and cheating concerns. 3. Connectivity issues – poor internet, limited data, and high costs of connectivity. 4. E-learning as a lonely journey – isolation, lack of peer support, and no group interaction. 5. Computer illiteracy and limited digital skills – lack of orientation and inadequate technical competencies among students and lecturers. E-learning was the only viable solution during the COVID-19 pandemic, but it posed significant challenges in resource-constrained settings when introduced abruptly. The findings emphasize the need for structured support systems, better training, and innovative methods to address practical, assessment, and digital literacy challenges.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			resource-constrained environment.					
9	Oana-Maria Păstae (2023). Italy	Systematic literature review guided by PRISMA principles.	To examine the extent and nature of collaborative learning practices in online and blended nursing education, identify methods and technologies used,	75 studies.	Four independent coders reviewed abstracts and full texts to ensure reliability.	Case studies, peer reviews, simulations, and role play, often mediated.	Deductive coding and cross-validation among coders.	Final dataset: 75 studies. Common approaches: discussions, peer assessments, case studies, and simulations. Technological tools: LMS, video conferencing, forums, and social media. Collaboration was often unstructured—few studies included tasks requiring joint artefact creation or collective outcomes. Limited empirical data on learning outcomes or performance improvement. Blended models often restricted collaboration to in-person components. The review reveals that while online collaboration is increasingly recognized as valuable for nursing education, its actual implementation often falls short of best pedagogical practices. Future programs should emphasize structured teamwork, authentic problem-solving, and shared outputs to strengthen digital competence and collaborative skills among nursing students.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			evaluate their educational impact, and propose future research directions for effective online collaboration in nursing training.					
10	Pozzi, F., et al. (2023). Australia	Systematic review of peer-reviewed studies.	To synthesize existing evidence on nurses' perceptions and experienc	15 studies.	The 2020 Preferred Reporting Items for Systematic Reviews and Meta-Anal	Studies on nurses or nursing students focusing on attitudes, perspectives, or	Thematic synthesis of qualitative and quantitative findings.	Positive perceptions: Flexibility, convenience, and accessibility of learning materials. Challenges: Lack of interaction with instructors/peers, technological difficulties, and insufficient practical training. Experiences: Nurses valued e-learning for continuing education, but effectiveness was often linked to the quality of platform design and institutional support. Overall: Mixed experiences, with strong support for blended

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			es of e-learning , and to identify enablers and barriers influencin g its effectiven ess in nursing education and professiona l developm ent.		ysis (PRISMA) guidelines (See Supplemen tary material 1), and the Joanna Briggs Institute (JBI) critical appraisal checklist for the different types of studies reviewed.	experiences with e-learning.		approaches (combining online and face-to-face training). E-learning is a valuable tool in nursing education and continuous professional development, but it cannot replace hands-on clinical training. Effective implementation requires addressing technological, pedagogical, and organizational challenges.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
11	Alfaleh, R., et al. (2023). Romania	Cross-sectional, multicentric study.	To evaluate Romanian medical students' perceptions and experiences with online learning during the COVID-19 pandemic.	611 general medicine students.	Self-developed, validated 58-item questionnaire.	Romanian medical students' perceptions of e-learning	Descriptive and inferential statistics using SPSS, significance level at $p < 0.05$.	Advantages of online learning: More free time (54.8%), comfort (31.4%), financial savings (12.8%). Disadvantages: Lack of interaction (59.2%), absence of practice (51.1%), loss of motivation (17.5%). Motivation: Dropped from 8.5/10 (pre-pandemic) to 5.4/10 during pandemic ($p < 0.001$). Temptation to cheat: Rose from 2.8/10 (pre-pandemic) to 7/10 (during pandemic). Medical training: Perceived training level decreased from 8/10 to 6.2/10. Self-confidence: Fell from 8.2/10 to 6.2/10. Overall impact: 75.9% of students reported a negative influence on professional development. Online learning provided some benefits (flexibility, accessibility, time efficiency), but the overall perception was negative, mainly due to lack of clinical practice, decreased motivation, lower self-confidence, and ethical concerns (cheating). While useful as a complementary tool, e-learning cannot fully replace hands-on medical training.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
12	Sutoi, D., et al. (2023). Romania	Quantitative descriptive study using survey.	To evaluate: 1. Students' experience, frequency, and satisfaction with online learning. 2. Whether online teaching is an effective alternative to face-to-face instruction. 3. The	105 students (7 specializations: pharmacy assistants, nursing, midwifery, kinesiotherapy, physical education).	Questionnaire with 15 structured questions (5-point and 4-point Likert scales).	Students' perceptions of online teaching effectiveness	Descriptive statistics with SPSS 26.	Experience: 78.1% rated online learning as "good", 6.7% "excellent". Effectiveness: 61% found online learning moderately effective, 30% very effective. Teacher support: 62 students found teachers very helpful, 17 extremely helpful. Technical issues: 71.4% sometimes experienced problems. Interaction: 64.8% said interaction depended on the course; 21.9% had less interaction. Learning outcomes: 97% reported achieving outcomes equivalent to in-person learning. Resources: 53.3% said availability depended on the course; 31.4% had more online resources. Convenience: 81% found access anytime/anywhere beneficial. Tools: 71.4% found online platforms easy to use. The study concluded that online teaching was generally effective, with students perceiving it as a valuable educational approach. However, improvements are needed in course design, instructor training, material provision, and technical infrastructure to ensure long-term success. E-learning is not simply a substitute for traditional teaching but requires innovation and adaptation.

Nr.	Author (s), year &country	Study Design	Study aim (s)	Sample	Data collection tools	Components relevant to data collection	Data analysis technique	Findings
			extent to which online tools supported learning outcomes, interaction, and convenience.					

Table 4. Characteristics of included studies