


Strategies for teaching nursing diagnosis in undergraduate nursing education: A scoping review

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ABSTRACT

Aim: Identify the characteristics of strategies employed in teaching nursing diagnoses in undergraduate nursing programs.

Background: The ability to formulate accurate nursing diagnoses is a core component of clinical reasoning and nursing diagnoses are the primary drivers of nursing processes. The optimal approach for students to acquire this competence remains insufficiently understood. Ongoing changes in nursing education have heightened the need to investigate which pedagogical strategies support students in learning and applying diagnostic reasoning.

Design: Scoping review conducted following the JBI methodology in March 2025. Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews guidelines was followed.

Methods: Seven databases were searched. Twenty-nine studies published between 1993 and 2024 were included. The review protocol was registered in the Open Science Framework DOI:10.17605/OSF.IO/UC3ZH.

Results: Strategies identified include simulation (n = 7), virtual tools (n = 6), educational programs (n = 6), group work (n = 3), case studies (n = 3) and other methods (n = 4), such as board games, outcome present state test model, guided visual metaphorical strategy and arch method.

Conclusions: The findings reveal the predominance of active, student-centred methodologies that foster critical thinking and reflective practice. These approaches appear to support the development of diagnostic competence and may contribute to preparation for clinical decision-making. This review points to the need for standardized evaluation tools and longitudinal research to explore the sustainability and scalability of these approaches in diverse educational contexts. Integrating these strategies into undergraduate curricula has the potential to strengthen students' engagement with clinical decision-making, promote reflective evidence-based practice and contribute to safer decision-making processes.

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Tweetable abstract: Active, student-centred strategies—especially simulation and virtual tools—enhance nursing students' diagnostic reasoning and documentation, but standardized evaluation and long-term impact remain underexplored.

1. Introduction

Nursing education is a dynamic and evolving field that aims to prepare nurses to meet the complex demands of modern healthcare environments. Over the years, nursing education has transitioned from hospital-based apprenticeship training to university-based programs, emphasizing the acquisition of baccalaureate degrees as the minimum requirement for professional practice (Jayasekara, 2021).

In recent decades, nursing education has increasingly emphasized clinical decision making and the integration of active learning methodologies. Strategies such as clinical simulation, case studies, problem-based learning and the use of digital technologies have been widely employed to foster the development of cognitive, attitudinal and technical competencies among students (Cant and Cooper, 2017; Ghezzi et al., 2021). Such approaches can promote the development of clinical judgment and the ability to apply the nursing process in real world settings.

The nursing process is the primary method nurses use to guide and document their care, applying a scientific approach to identify health needs, establish diagnoses, plan and implement interventions and evaluate outcomes within the boundaries of the nursing discipline (Rodríguez-Suárez et al., 2023). Decision-making in nursing—covering the selection of diagnoses, interventions and expected outcomes—can be evaluated through standardized nursing language systems such as those presented by NANDA International, the Nursing Interventions Classification (NIC) (Wagner et al., 2025) and the Nursing Outcomes Classification (NOC) (Moorhead et al., 2024).

Clinical reasoning models position nursing diagnoses as the driving force of the nursing process, highlighting the logical relationships between the nursing diagnosis, expected outcomes and interventions. Therefore, ensuring diagnostic accuracy is fundamental to the development of nursing knowledge and is intrinsically linked to the quality of data collected during assessment, as well as to the application of the principles of clinical reasoning models (T. Herdman et al., 2024; T. H. Herdman and Lopes, 2024).

Although nursing diagnosis represents a central component of both the nursing process and the nurse's clinical reasoning, its teaching faces significant challenges and variations across institutions (Kurt et al., 2024). It is essential to identify the strengths and gaps in nursing education related to diagnostic reasoning and to adopt teaching strategies that reinforce evidence-based practice, promote robust training in clinical reasoning and ensure quality-of-care delivery.

The literature indicates that the quality of nursing diagnosis education is directly linked to the development of critical thinking and clinical reasoning. Recent studies have emphasized the need for pedagogical strategies that foster reflection and clinical case analysis, bringing students closer to real care scenarios and encouraging evidence-based decision-making (Leal et al., 2024; Oliveira Silva et al., 2025; Pérez-Perdomo and Zabalegui, 2023). Thus, teaching nursing diagnoses goes beyond the memorization of terms and definitions, constituting a process of constructing clinical reasoning skills.

Previous studies have not specifically examined the teaching of nursing diagnoses at the undergraduate level or the strategies used to support this learning (Leal et al., 2024; Li et al., 2026; Liu et al., 2025). By addressing this gap, the present study contributes new evidence and underscores the importance of synthesizing these strategies to strengthen the pedagogical foundations of nursing diagnosis education in undergraduate programmes.

Nursing education is experiencing significant transformations in response to the evolving demands of healthcare. Given the

methodological diversity and limited number of studies in this field, it is essential to critically examine the educational strategies described in the literature that aim to strengthen the teaching of nursing diagnoses in undergraduate nursing programs. These changes have prompted a rethinking of pedagogical approaches. Accordingly, through this scoping review, we seek to identify the characteristics of the strategies employed in teaching nursing diagnoses within undergraduate nursing programs.

2. Materials and methods

This scoping review was conducted in accordance with the JBI methodological recommendations (Aromataris et al., 2024). The review protocol was registered in the Open Science Framework DOI:10.17605/OSF.IO/UC3ZH. This scoping review was performed and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guideline (Page et al., 2021).

The research question guiding this study was as follows: What are the characteristics of strategies employed in teaching nursing diagnoses in undergraduate nursing programs?

2.1. Database and search methods

Research conducted in PROSPERO, the Open Science Framework, the Cochrane Library and MEDLINE found no records or protocols of scoping or systematic reviews and no published reviews.

The search strategy was structured across these stages. Initially, a search was conducted in the PubMed and CINAHL databases. Subsequently, the titles and abstracts of the retrieved studies, along with their indexing terms, were examined. Based on the keywords and standardised descriptors identified in this preliminary review, a comprehensive search strategy was formulated and subsequently applied to all selected databases.

The formulation of the research question served as the foundation for selecting the terms used in the search strategies. To construct this strategy, descriptors from Medical Subject Headings (MeSH), Health Sciences (DeCS) and terminology extracted from articles identified during the initial exploratory phase were included. Boolean operators AND and OR were applied to refine the search: AND was used to establish restrictive combinations, whereas OR was employed to broaden the scope through additive combinations. The specific strategies adopted are listed in Table 1. To optimize the search strategy, support was provided by a specialized medical university librarian, who assisted throughout the process.

The search was performed in December 2024, but it was updated in March 2025 using the following databases: PUBMED, Cumulative Index to Nursing & Allied Health (CINAHL), via EBSCO, Scopus, Web of Science, Embase via Elsevier, Virtual Health Library and Education Resources Information Center (ERIC).

2.2. Inclusion and exclusion criteria

Eligibility was determined based on the PCC strategy: P (Population), undergraduate nursing students; C (Concept), strategies used in teaching nursing diagnoses; C (Context), undergraduate nursing education.

The inclusion criteria were as follows: studies that addressed teaching strategies for nursing diagnoses aimed at undergraduate nursing students. Articles written in English, Portuguese and Spanish were included. According to the JBI methodology, authors are not required to

Table 1
Search strategy.

Databases	Strategy	No.
PUBMED	((("Students"[Mesh]) OR "Students, Nursing"[Mesh] OR Student OR Students OR "Nursing Student" OR "Nursing Students") AND ("Nursing Diagnosis"[Mesh] OR "Nursing Diagnosis" OR "Nursing Diagnoses")) AND ("Teaching"[Mesh] OR "Education"[Mesh] OR "Learning"[Mesh] OR "Teaching" OR "Education" OR "Learning")	245
CINAHL	((MH "Students") OR (MH "Students, Nursing") OR Student OR Students OR "Nursing Student" OR "Nursing Students") AND ((MH "Nursing Diagnosis" OR "Nursing Diagnoses") AND ((MH "Teaching") OR (MH "Learning") OR Teaching OR Learning)	178
Virtual Health Library	((Students OR Estudiantes OR Estudiantes) OR (Student OR Estudiante OR Estudiante)) AND (("Nursing Diagnosis" OR "Diagnóstico de Enfermería" OR "Diagnóstico de Enfermagem") OR "Nursing Diagnoses") AND ((Teaching OR Enseñanza OR Ensino) OR (Learning OR Aprendizaje OR Aprendizagem))	765
Embase	('student'/exp OR 'apprentice' OR 'student' OR 'students' OR 'nursing student') AND ('nursing diagnosis'/exp OR 'nursing diagnoses' OR 'nursing diagnosis') AND ('teaching'/exp OR 'teaching' OR 'learning'/exp OR 'learning')	150
Scopus	(student OR students OR "nursing student" OR "nursing students") AND ("nursing diagnosis" OR "nursing diagnoses") AND (teaching OR learning)	173
Web of science	(student OR students OR "nursing student" OR "nursing students") AND ("nursing diagnosis" OR "nursing diagnoses") AND (teaching OR learning)	223
Education Resources Information Center	(student OR students OR "nursing student" OR "nursing students") AND ("nursing diagnosis" OR "nursing diagnoses") AND (teaching OR learning)	8
Total		1742

include languages other than English; however, it is recommended that reviewers analyze other languages when competent (Stern and Kleijnen, 2020). Therefore, we added Portuguese and Spanish, as these languages are mastered by the team members. Other languages were excluded because of feasibility issues and lack of funding for translators. Opinion articles, letters to the editor and secondary research (reviews) were excluded because they did not align with our objectives or data extraction criteria. Consequently, original research articles (qualitative, quantitative and mixed methods) were included in this review. Notably, no time limit was applied to this study.

The exclusion criteria were as follows: articles involving post-graduate students, including those at the Master's or Doctoral level, as well as articles derived from reviews, books, or commentaries.

2.3. Study selection

The identified studies were imported into the Rayyan web-based platform developed by the Qatar Computing Research Institute (QCRI), which facilitates the blind, individual and simultaneous selection of articles. Within the system, duplicate records were removed and the selection process was conducted in two stages: initial screening of titles and abstracts, followed by a thorough review of the full text. This process was performed by two independent reviewers (AN and SM). Any discrepancies regarding the inclusion or exclusion of studies were resolved through discussion and mutual agreement between the reviewers. Articles that fulfilled the inclusion criteria were read in their entirety and subjected to a detailed evaluation during the data extraction phase.

During the identification phase, duplicate records were removed and eligibility criteria were applied during the full-text review. Data extraction from the included studies was performed independently by two reviewers (AN and SM).

Four reviewers (AN, SM, RD and AE) independently extracted and organized the data using a preformatted spreadsheet in Microsoft Excel. Any discrepancies between their entries were addressed by discussion (AN, SM, RD and AE) on a case-by-case basis, with discussions held to harmonize the data and reach a mutual agreement.

2.4. Data extraction and synthesis

The data extracted from the studies were predefined and are presented in a simplified format. As outlined in Table 2, the following information was collected: author names, year of publication, country of origin, precise description of the study objective, study design, participant details, strategy used to teach nursing diagnoses and reported outcomes. Studies were classified using JBI's evidence level (Joanna Briggs Institute JBI, 2020).

3. Results

A total of 1742 potentially eligible studies were initially identified through electronic databases. After the removal of duplicate records, 931 articles were excluded following the screening of titles and abstracts, based on the predefined eligibility criteria. Consequently, twenty-nine studies were included, allowing for a qualitative analysis (Fig. 1).

This scoping review includes 29 published articles between 1993 and 2024, with 37.9% (n = 11) of the studies falling within the period from 2020 to 2024. Most studies originated from Brazil (n = 12; 41.4%), followed by Turkey (n = 5; 17.2%), the United States (n = 3; 10.3%) and Italy (n = 3; 10.3%). The study design included descriptive observational studies (n = 11; 37.9%), quasi-experimental studies (n = 10; 34.5%), clinical trials (n = 6; 20.7%) and analytical observational studies (n = 2; 6.7%), Table 2.

The strategies identified for teaching nursing diagnoses to undergraduate nursing students, were grouped as follows: strategies involving simulation (n = 7, 24.1%) (Costa and Luz, 2015; Forsberg et al., 2011; Oliveira Silva et al., 2024; Ordu and Çalıřkan, 2023b, 2023a; Tinoco et al., 2021; Wong and Chung, 2002), use of virtual tools (n = 6; 20.7%) (Avelino et al., 2016; Bustami et al., 2023; Hinck et al., 2006; Jensen et al., 2012; Lopes et al., 2013; Sousa et al., 2016), implementation of educational programs (n = 6; 20.7%) (Ayten et al., 2023; Carvalho et al., 1996; Kim and Jung, 2016; Lee and Brysiewicz, 2009; Maurício et al., 2022; Silva et al., 2007), group work (n = 3, 10.3%) (Abbasi et al., 2017; KURTÖZ et al., 2024; Lenopoli et al., 2022), case studies (n = 3; 10.3%) (Bertocchi et al., 2024; Karaca and S, 2018; Palese et al., 2008) and a final category labeled Other (n = 4; 13.8%). The "Other" category includes diverse methods such as board games (Tinoco et al., 2023), the Outcome-Present State test model (Ibáñez-Alfonso et al., 2019), guided visual metaphorical strategies (Jeffreys, 1993) and the Arch method (Nakati et al., 2000).

Simulation-based strategies have consistently been used to teach diagnostic reasoning, particularly in enhancing diagnostic reasoning, documentation quality and student confidence (Oliveira Silva et al., 2024; Ordu and Çalıřkan, 2023a, 2023b; Tinoco et al., 2021). Virtual tools such as educational software and mobile applications, improve metacognitive awareness, accuracy in diagnosis formulation and student engagement (Bustami et al., 2023; Jensen et al., 2012; Sousa et al., 2016).

Educational programs yielded mixed results. While some studies reported increased confidence and improved understanding of nursing taxonomies (Kim and Jung, 2016; Lee and Brysiewicz, 2009), others found limited impact on diagnostic accuracy (Maurício et al., 2022). Group work strategies foster collaborative learning and critical thinking,

Table 2
Characterization of the included studies.

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Tinoco et al., 2023) Brazil	To assess the “ <i>Enfermeiro Diagnosticador</i> ” board game effectiveness for teaching diagnostic reasoning among nursing students.	Quasi-experimental /2a	Undergraduate nursing students (n = 11)	Board game titled “ <i>Enfermeiro Diagnosticador</i> ” <ul style="list-style-type: none"> Based on clinical cases with clues representing diagnostic indicators. Includes cards with commands, hints, and prompts to stimulate diagnostic reasoning. Structured around Gordon’s functional health patterns and NANDA-I taxonomy (2018–2020). 	Board game	<ul style="list-style-type: none"> Significant improvement in students’ diagnostic reasoning after the intervention: Increased accuracy in identifying nursing diagnoses and using correct connectors. Statistically significant difference in correct diagnoses between pre- and post-test. Improved identification of diagnostic indicators and formulation of diagnostic statements. 	<ul style="list-style-type: none"> Comparison of students’ performance before and after the intervention (correct diagnoses). Pre/post statistical comparison with McNemar test
(Maurício et al., 2022) Brazil e United States	To evaluate the effect of the Self-Instructional Guide for Clinical Reasoning on the diagnostic accuracy of undergraduate nursing students.	Randomized controlled clinical trial parallel, double-blind design/1c	Undergraduate Nursing students (n = 51): intervention group (n = 27) and control group (n = 24)	Self-instructional Guide for Clinical Reasoning <ul style="list-style-type: none"> Based on the <i>Developing Nurses’ Thinking</i> model. Used during case study resolution to guide students in identifying nursing diagnoses, etiologies, and relevant clinical cues. 	Self-instructional Guide for Clinical Reasoning	<ul style="list-style-type: none"> No improvement observed; in fact, diagnostic accuracy decreased in the intervention group No statistically significant difference between groups or overtime. A single application of the guide was not effective. Students reported better support for clinical reasoning (84.85%), case essence identification (75.76%), and diagnostic clarity (66.67%). The OPT model enhances students’ ability to think critically and reflectively. 	<ul style="list-style-type: none"> Rubric for diagnostic and etiological accuracy created by the authors (based on the Lunney Scoring Method). Demographic and perception questionnaire
(Ibáñez-Alfonso et al., 2019) Colombia	Compare the nursing process application models (generation 2 and 3), in the elaboration of care plans by students of the nursing program at an institution of higher education in Bucaramanga (Colombia).	Cross-sectional comparative study/4b	Undergraduate nursing students (n = 33)	Comparison of two models for nursing care plans: <ul style="list-style-type: none"> Second-generation model: Traditional linear nursing process. Third-generation model (OPT): Outcome-Present State Test model, which emphasizes clinical reasoning, case essence, and diagnostic prioritization. 	Outcome Present State Test	<ul style="list-style-type: none"> Students reported better support for clinical reasoning (84.85%), case essence identification (75.76%), and diagnostic clarity (66.67%). The OPT model enhances students’ ability to think critically and reflectively. 	Instrument created by the authors themselves to compare: <ul style="list-style-type: none"> the 2nd-generation model (traditional nursing process) the 3rd-generation model (OPT model)
(Jensen et al., 2012) Brazil	Describes the development and evaluation of software that verifies the accuracy of diagnoses made by nursing students	Accuracy assessment /4b	Undergraduate nursing students (n = 27)	Software name: <i>Fuzzy Kitten</i> (Based on fuzzy logic), allowing nuanced evaluation of diagnostic reasoning. Students complete a four-stage activity: <ul style="list-style-type: none"> Establish relationships between nursing diagnoses and defining characteristics/risk factors. Analyse a clinical case. Identify present signs/symptoms. Determine and classify nursing diagnoses. 	Software name: <i>Fuzzy Kitten</i>	<p>Technical quality: Rated positively by experts in functionality, usability, and efficiency.</p> <p>Usability: 96.2% of students rated it as good, very good, or excellent.</p> <p>Educational impact:</p> <ul style="list-style-type: none"> Helped students reflect on their diagnostic reasoning. Encouraged metacognition and 	<ul style="list-style-type: none"> Instrument for evaluating the software’s technical quality (Sperandio) Usability questionnaire developed by the authors

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Forsberg et al., 2011) Sweden	To investigate nursing students' opinions on the use of Virtual Patients for assessing clinical reasoning and clinical decision-making skills, as well as to study the possibilities and challenges of implementing a new, dedicated clinical reasoning assessment module in the Web-SP Virtual Patient system.	Descriptive study (Pilot study - exploratory, mixed- methods)/4c	Undergraduate nursing students (n = 77)	Virtual Patients using the Web-SP system: <ul style="list-style-type: none"> • Students interact with simulated clinical scenarios online. • Tasks include history taking, physical exams, lab test selection, diagnosis, and care planning. • A semi-automated scoring system tracks student decisions and reasoning. • Some students also contributed to case creation based on real clinical experiences. 	Virtual Patients	<p>improved understanding of NANDA-I taxonomy.</p> <ul style="list-style-type: none"> • Provided objective feedback through performance scores. • High acceptance of VP-based assessment. • Found cases realistic, engaging, and relevant to nursing practice. • Most students provided correct diagnoses and appropriate care plans 	Questionnaire developed by the authors to evaluate students' acceptance and opinions regarding the use of virtual patients for the assessment of clinical reasoning
(Lee and Brysiewicz, 2009) South Africa	To implement a change in the clinical nursing course in the third year of the Bachelor of Nursing program and determine if this changes improved students' problem solving and care planning	Quasi experimental/ 2d	Third-year Bachelor of Nursing students (n = 70): control group –2005 (n = 39) and in intervention group - 2006 (n = 31).	Implementation of an educational intervention in the intervention group Comparison of performance results (triple jump scores) with historical data from 2005. Nine-step problem solving process: <ul style="list-style-type: none"> • Structured approach to clinical scenarios. • Emphasis on formulating nursing diagnoses and linking them to care planning. • A three-phase evaluation tool measuring problem-solving and care planning. 	Program of 4 h (Triple Jump Assessment)	<p>Students in the intervention group (2006) showed moderate improvement in triple jump scores. Students appreciated the structured approach and felt more confident in applying nursing diagnoses. The intervention helped bridge the gap between classroom learning and clinical application</p>	Statistical analysis of the Triple Jump Assessment
(Silva et al., 2007) Brazil	To carry out teaching and learning process – theoretical as well as practical - with undergraduate students on nursing diagnosis for ICUs, apprehending participants' experiences in this process	Convergent Care Research (descriptive study)/ 4c	Undergraduate nursing students in their 7th semester (n = 11)	Three-phase teaching-learning process: <ol style="list-style-type: none"> 1. Extracurricular classes (60 h) on nursing care systematization and nursing diagnosis. 2. Practical application of theoretical concepts in an adult ICU over 9 days (45 h), with daily reflection sessions. 3. Semi-structured interviews to capture students' experiences and perceptions. 	Extracurricular classes/ Practical application	<ul style="list-style-type: none"> • Students shifted from a disease-centered approach to a more humanized, patient-centered model. • Use of nursing diagnoses encouraged deeper reflection and integration of psychosocial, biological, and spiritual dimensions. • Students reported stronger connections with patients and families. • The process helped students value the nursing diagnosis as 	Semi-structured interviews

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Bertocchi et al., 2024) Italy	To evaluate the impact of using the Nursing Process–Clinical Decision Support System (NP-CDSS), and more reliable results could only be obtained by enrolling students who did not have previous experiences with the system, like the population recruited in this study	Quasi-experimental study/2c	Third-year undergraduate nursing students (n = 66)	Comparison of two documentation methods: 1. Traditional paper-based approach using NANDA-I tax- onomy and structured grids. 2. Electronic Nursing Process–Clinical Decision Support System (NP-CDSS) called <i>Florence</i> , which guides students through the nursing process using standardized terminologies (NANDA-I, NIC, NOC) and Gordon’s Functional Health Patterns. Students solved three clinical scenarios (cancer, stroke, myocardial infarction) using both methods, with a 30-day interval and training on the NP-CDSS	Computerized system versus a traditional paper-based approach (clinical cases)	central to care planning and delivery. Improved diagnostic accuracy with NP-CDSS in cancer and stroke scenarios No significant improvement in myocardial infarction scenario. Higher number of correct diagnostic indicators (defining characteristics, related factors) using NP- CDSS across all scenarios.	<ul style="list-style-type: none"> • Ordinal Scale for Degrees of Accuracy • Italian Version of the 10- item System Usability Scale • 5-point Likert Satisfaction Item (overall student satisfaction with the educational experience)
(Karaca and S, 2018) Turkey	To determine nursing students’ perception of nursing diagnosis and the effect of ‘nursing terminologies and classifications’ course on this perception	Quasi-experimental /2c	Undergraduate nursing students (n = 155): students in the “Nursing Terminologies and Classification” course (n = 71) and students who did not take the course (n = 84)	28-hour course on nursing terminologies and classifications, including: <ul style="list-style-type: none"> • History and importance of standardized terminology • Critical thinking elements • NANDA-I nursing diagnoses • NIC (Nursing Interventions Classification) • NOC (Nursing Outcomes Classification) • Case study practice using Lunney’s clinical reasoning framework 	28-hour course	<ul style="list-style-type: none"> • Students who took the course had significantly more positive perceptions overall • Significant improvement in “ease of use” and “clear representation of patient situation” • No significant difference in “conceptual orientation” and “delineation and promotion of nursing profession” • Students who took the course were more likely to: understand the practical application of nursing diagnoses 	Perceptions of Nursing Diagnosis Survey
(Ordu and Çalışkan, 2023b) Turkey	To investigate the effects of virtual gaming simulation on the nursing diagnosis, goal setting and diagnosis prioritization of first-year nursing students	Randomized Controlled Trial/ 1c	First-year undergraduate nursing students (n = 102): intervention group (n = 51) and control group (n = 51)	<ul style="list-style-type: none"> • Virtual Gaming Simulation (VGS) A 2D interactive computer game with branching scenarios based on a COPD case. Students played the simulation to practice: <ul style="list-style-type: none"> o Identifying nursing diagnoses o Setting goals o Prioritizing diagnoses • Control Group received traditional classroom 	Virtual Gaming Simulation	Significant improvement in: <ul style="list-style-type: none"> • Nursing diagnosis knowledge • Goal-setting knowledge No significant difference in: <ul style="list-style-type: none"> • Diagnosis prioritization knowledge VGS -students found it easy to use and visually realistic and reported increased memorability and engagement	<ul style="list-style-type: none"> • Scoring analysis of the virtual evaluation simulation • Statistical analysis

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Jeffreys, 1993) United States	To describe a novel strategy for teaching nursing diagnosis by stimulating metaphorical thought processes.	Descriptive Implementation Study/4c	Undergraduate nursing students (n = 19)	instruction using PowerPoint and discussion. Guided Visual Metaphor (GVM) A six-step, learner-centered strategy using visual and verbal techniques: 1. Drawing and labeling a diagram of the patient 2. Reflecting on how each item affects the whole person 3. Identifying strengths and problems 4. Selecting nursing diagnoses 5. Prioritizing diagnoses 6. Group discussion and reflection Based on Langer's theory of visual metaphorical thought and Kaufmann's theory of symbolic activity in problem-solving.	Guided Visual Metaphor	Positive student evaluations: <ul style="list-style-type: none"> All students found GVM helpful for diagnosis selection. Most found it useful for prioritization and understanding clinical experiences. Students reported increased confidence and engagement. 	Student Evaluation Survey
(Wong and Chung, 2002) China	To explore the diagnostic reasoning process among nursing students with different learning environments.	Descriptive study (Case Study Design)/4c	Final-year undergraduate nursing students (n = 20)	Patient Simulation via PatientSim System Students interacted with a high-fidelity simulator across three scenarios (Peptic ulcer, Hypoglycemia, Shortness of breath)	Patient Simulation via PatientSim System	No significant difference overall, but nursing school students scored higher on achieving strategy Significant difference in reasoning patterns in Scenario 2 (hypoglycemia) between groups <ul style="list-style-type: none"> Both groups showed significant improvement in NP knowledge post-intervention No statistically significant difference between groups in knowledge scores No significant differences in planning, implementation, or evaluation steps Implementation group reported higher satisfaction than control group 	Biggs' Study Process Questionnaire
(Ayten et al., 2023) Turkey	To investigate the effects of web-based education on nursing students' learning of the nursing process.	Quasi-experimental pre/post-test design/2c	Second-year nursing undergraduate students (n = 90): implementation group (n = 44) and control group (n = 46):	Implementation group received web-based education + traditional classroom instruction and control group received only traditional classroom instruction Web-based Nursing Process Program Developed by researchers and software experts, the platform included: <ul style="list-style-type: none"> Standardized data collection forms based on functional health patterns 142 NANDA-I nursing diagnoses with defining characteristics and related factors Goal-setting templates and nursing intervention lists Interfaces for planning, implementation, and evaluation PDF export of completed care plans Students accessed the platform via mobile, tablet, or computer during clinical practice in internal medicine and surgical units	Web-based Nursing Process Program	<ul style="list-style-type: none"> Both groups showed significant improvement in NP knowledge post-intervention No statistically significant difference between groups in knowledge scores No significant differences in planning, implementation, or evaluation steps Implementation group reported higher satisfaction than control group 	<ul style="list-style-type: none"> Identification Form Nursing Process Knowledge Form Visual Analog Scale Nursing Process Assessment Form

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Oliveira Silva et al., 2024) Brazil	To develop and validate a simulation scenario focusing on the nursing process applied to children with respiratory diseases and their families, and to implement the simulation scenario with nursing students.	Descriptive Study of Development and Validation of Educational Intervention/4d	Undergraduate nursing students from 4th year (n = 26)	Simulation-Based Learning Scenario - Focused on pediatric respiratory complications Debriefing for Meaningful Learning	Simulation-Based Learning Scenario	<ul style="list-style-type: none"> High scores on the Simulation effectiveness Tool Strong correlation between knowledge and quality of nursing documentation Positive correlations between debriefing and self-confidence 	<ul style="list-style-type: none"> Student Satisfaction and Self-Confidence in Learning Knowledge About the Nursing Process Checklist of Expected Actions and Competencies Mobilized Lasater Clinical Judgment Rubric – Brazilian Version Socio-demographic data sheet Evaluation questionnaire
(Lenopoli et al., 2022) Italy	To evaluate the effectiveness of peer learning for nursing students in developing knowledge, diagnostic reasoning and decision-making skills.	Randomized Controlled Pilot Study/1c	Undergraduate nursing students (n = 113): intervention group (n = 68) and control group (n = 45)	Peer learning through clinical case discussions without teacher supervision	Peer Learning Intervention	<p>Better diagnostic reasoning skills were demonstrated by students in the intervention group</p> <p>Enhanced student engagement and reflection</p> <p>High satisfaction with course structure and materials</p> <p>Positive impact on collaborative learning and critical thinking</p>	<ul style="list-style-type: none"> COLLES Survey System Usability Scale Statistical analysis
(Avelino et al., 2016) Brazil	To develop and evaluate a course on a Moodle Platform on diagnoses, interventions, and nursing outcomes according to the International Classification for Nursing Practice.	Quantitative, descriptive, cross-sectional study/4b	Undergraduate nursing students (n = 25) and professionals (n = 26)	Online course via Moodle platform focused on ICNP® (International Classification for Nursing Practice)	Moodle	<p>Improved diagnostic reasoning in both groups (software and traditional method)</p> <p>Wise Nurse software: facilitates use of NANDA-I taxonomy in nursing education</p>	<ul style="list-style-type: none"> Written test scores increased from 24.1 to 47.5 out of 100 Practical performance was superior to theoretical evaluation Students successfully formulated nursing diagnoses using NANDA taxonomy
(Sousa et al., 2016) Brazil	To describe the construction and evaluation of new educational software called Wise Nurse, which was developed to increase the capacity of student nurses to identify nursing diagnoses (NDx) and to establish relationships between NDx, defining characteristics (DC), and related factors (RF).	Randomized controlled trial/1c	Undergraduate nursing students from 2nd to 4th year (n = 37): experimental group (n = 20), and control group (n = 17)	Wise Nurse software: <ul style="list-style-type: none"> Designed to help students identify nursing diagnoses Focused on linking NDx with defining characteristics (DC) and related factors (RF) Compared to traditional printed clinical case exercises 	Software called Wise Nurse	<p>Wise Nurse software: facilitates use of NANDA-I taxonomy in nursing education</p>	<ul style="list-style-type: none"> Students' activity reports Cognitive and affective evaluation instruments (written test, evaluation of nursing diagnoses)
(Nakati et al., 2000) Brazil	To analyse the implementation of the offer in teaching the diagnostics of nurse service according to taxonomy I of NANDA, through problematical pedagogy, made real by arch method	Action research/3b	Undergraduate nursing students from 2nd year (n = 19)	Problemization Pedagogy via the Arch Method <ul style="list-style-type: none"> Structured in phases: observation of reality, theorization, hypothesis of solution, and application Emphasized critical thinking, reflection, and real-world practice Used NANDA taxonomy for nursing diagnoses 	Arch Method	<ul style="list-style-type: none"> Written test scores increased from 24.1 to 47.5 out of 100 Practical performance was superior to theoretical evaluation Students successfully formulated nursing diagnoses using NANDA taxonomy 	<ul style="list-style-type: none"> Students' activity reports Cognitive and affective evaluation instruments (written test, evaluation of nursing diagnoses)
(KURTĞÖZ et al., 2024) Turkey	To evaluate the effect of training according to learning styles on students' ability to make nursing diagnoses.	Quasi-experimental one-group pre-test/post-test design/3c	Undergraduate nursing students from 2nd year (n = 63)	Training based on students' learning styles, identified via the VARK Inventory <ul style="list-style-type: none"> Students are grouped by learning style: Visual, Aural, Read/Write, Kinesthetic All groups received a core presentation on nursing diagnoses and the NANDA-I taxonomy 	Training based on students' learning styles	<p>Students showed better diagnostic accuracy across more NANDA-I domains after training</p> <p>Diagnoses expanded beyond physiological domains to include Health Promotion, Cognition, and Self-Perception</p>	Case Diagnosis Form (pre-test)

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Kim and Jung, 2016) South Korea	To develop and evaluate comprehensive web-based learning program for improving learning ability in the nursing process of nursing students.	Descriptive study/4c	Undergraduate nursing students, (n = 62)	Web-based nursing process program integrating NANDA-I, NOC, and NIC (NNN linkage)	Web-based nursing process program	<ul style="list-style-type: none"> Improved achievement of learning objectives Increased satisfaction Enhanced confidence and reduced anxiety in applying the nursing process Higher knowledge scores among frequent users of the program Increased autonomy, motivation, and pleasure in learning Improved computer skills Positive feedback on language clarity, review activities, and bibliography Perceived effectiveness in supporting diagnostic reasoning for the integumentary system 	<ul style="list-style-type: none"> Program reactivity metrics Satisfaction Questionnaire Confidence and Anxiety Levels were measured using a numeric rating scale
(Costa and Luz, 2015) Brazil	To evaluate a virtual learning object (VLO) developed to mediate the teaching of diagnostic reasoning in nursing and to be applied to the integumentary system by undergraduate nursing students	Descriptive/4c	Undergraduate nursing students (n = 21)	Virtual Learning Object (VLO) focused on diagnostic reasoning in nursing	Virtual Learning Object	<ul style="list-style-type: none"> Increased autonomy, motivation, and pleasure in learning Improved computer skills Positive feedback on language clarity, review activities, and bibliography Perceived effectiveness in supporting diagnostic reasoning for the integumentary system 	<ul style="list-style-type: none"> Evaluation Questionnaire of the Virtual Learning Object
(Abbasi et al., 2017) Iran	Investigate the effect of the Buzz Group educational strategy on improving nursing diagnostic skills among seventh-semester students	Quasi-experimental (pretest-post test design with control group)/2c	Undergraduate nursing students in their 7th semester (n = 64)	Buzz Group Method (small collaborative group discussions) (The “Buzz group” method is a group learning technique, which is carried out in the form of a four- or two-person discussion. In other words, the members of the class compare their answers two by two to detect any differences.)	Buzz group	<ul style="list-style-type: none"> Significant improvement in nursing diagnostic skills Enhanced critical thinking and performance Increased number and accuracy of nursing diagnoses 	<ul style="list-style-type: none"> Researcher-made written questionnaire
(Carvalho et al., 1996) Brazil	To verify the adequacy of the data analysis and synthesis process and its relationship with the establishment of nursing diagnoses by undergraduate students.	Descriptive, educational intervention study/4c	Undergraduate nursing students (n = 53)	Theoretical and practical instruction using RISNER’s diagnostic process model and NANDA Taxonomy I	Theoretical and practical	<ul style="list-style-type: none"> High identification of diagnostic steps (>90%) Major difficulties in “relation” and “data clustering” phases 90.6% correctly assigned diagnostic categories despite reasoning errors Frequent errors linked to gaps in pathophysiology knowledge and clinical judgment 	<ul style="list-style-type: none"> Analysis of the students’ diagnostic formulations
(Bustami et al., 2023) Indonesia	the research aims to uncover valuable insights and ensure that the development of Virtual Nursing Diagnosis aligns perfectly with the expectations and requirements of its intended users	Descriptive study/4c	Undergraduate nursing students (n = 253)	Development and implementation of a mobile learning app - Virtual Nursing Diagnosis (VND) - with features like assessment forms, pathology content, diagnostic tools, and case-based competency tests	APP — Virtual Nursing Diagnosis	<ul style="list-style-type: none"> High student satisfaction and engagement (98.4% interest in mobile learning) Improved accessibility and flexibility in learning 	<ul style="list-style-type: none"> Student Response Questionnaire

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
(Ordu and Çalışkan, 2023a) Turkey	To determine the effect of virtual game simulation on nursing students' perception of nursing diagnosis and clinical practice.	Post-test-only randomized controlled trial/1c	Undergraduate nursing students (n = 92): experimental group (n = 46) and control group (n = 46)	Virtual Game Simulation focused on nursing diagnosis and goal setting	Virtual Game Simulation	<ul style="list-style-type: none"> Enhanced ability to apply nursing diagnoses in clinical practice Positive feedback on usability and effectiveness of the VND app Improved perception of nursing diagnosis among students Positive impact on clinical practice skills Students reported better ability to determine diagnoses, set goals, and document patient data Some challenges remained in data collection and patient communication 	<ul style="list-style-type: none"> Perceptions of Nursing Diagnoses Survey Form for Evaluating the Effect of Virtual Game Simulation on Clinical Practice
(Tinoco et al., 2021) Brazil	To evaluate the effect of an educational intervention based on virtual clinical simulation and problem-based learning using a mobile application in a clinical nursing education context as a tool to improve clinical reasoning skills of students on the second year of nursing graduation	Prospective quasi-experimental study/2c	Undergraduate nursing students from 2nd year (n = 32): experimental group (n = 16) and control group (n = 16)	Diagnostician Nurse mobile app using virtual clinical simulation + Problem-based learning The intervention combined: <ul style="list-style-type: none"> Virtual clinical simulation Problem-based learning (PBL) Mobile application: Diagnostician Nurse 	Diagnostician Nurse mobile app using virtual clinical simulation + PBL	<ul style="list-style-type: none"> Improved diagnostic prioritization and reasoning High usability and quality ratings for the app Increased student motivation and satisfaction 	<ul style="list-style-type: none"> Pre-test and post-test with clinical cases (clinical reasoning assessment) System Usability Scale Learning Object Review Instrument
(Lopes et al., 2013) Brazil	To describe a model for assessing nursing diagnostic accuracy and its application to undergraduate students, comparing students' performance according to the course year.	Descriptive /3c	Undergraduate nursing students from 3rd and 4th year (n = 38)	The study introduced a Model for Evaluation of Diagnostic Accuracy Based on Fuzzy Logic, which: <ul style="list-style-type: none"> Assesses how students relate defining characteristics/risk factors to nursing diagnoses Use a three-step process: <ul style="list-style-type: none"> Students assign relationship values between DC/RF and nursing diagnoses Students analyse a clinical case Students indicate presence of defining characteristics/risk factors in the case Applies max-min fuzzy composition to infer diagnoses and compare student reasoning to expert benchmarks 	Diagnostic accuracy evaluation using fuzzy logic-based decision support tool	<ul style="list-style-type: none"> Objective scoring of diagnostic reasoning Differences in performance by year Enhanced metacognitive awareness 	<ul style="list-style-type: none"> Model for Evaluation of Diagnostic Accuracy Based on Fuzzy Logic Statistical analysis
(Palese et al., 2008) Italy	To establish a relationship between tutorial strategies orientated to enhance critical thinking and the accuracy of diagnostic reasoning (i.e. the number of correct answers given by students on	Double pragmatic experimental trial/1c	Undergraduate nursing students from 1st year (n = 144)	Four tutorial strategies were evaluated: <ol style="list-style-type: none"> Laboratory sessions – Simulated cases with guided reflection. 	Case study + laboratory session	<ul style="list-style-type: none"> Students exposed to intensive tutorial strategies (lab + clinical tutoring) made 	<ul style="list-style-type: none"> Diagnostic Accuracy Assessment Using Simulated Clinical Cases

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Table 2 (continued)

Author Year Country	Purpose	Research Design/ level of evidence JBI	Participants	Strategy to teach nursing diagnoses	Strategy	Outcomes	Tools or assessments to measure outcomes (direct or indirect)
	simulated cases in two different nursing education contexts).			2. Intensive clinical tutoring – Daily debriefings with pedagogically trained tutors. 3. Weekly tutorials – Structured reflection once a week. 4. Routine tutoring – Unstructured, practice-based learning with ward staff. Each strategy varied in tutor expertise, frequency, and pedagogical approach.		significantly fewer diagnostic errors. • Routine tutoring was associated with a higher risk of incorrect diagnoses. • Students with intensive strategies showed better accuracy in identifying patient problems . • Interestingly, students with less effective strategies often felt more confident, despite poorer performance	• Diagnostic Reasoning Self-Evaluation Questionnaire • Numerical Rating Scale for Perceived Difficulty
11 (Hinck et al., 2006) United States	To evaluate the effectiveness of concept mapping as a learning strategy for junior-level baccalaureate nursing students to plan and evaluate nursing care during a community-based mental health course.	Quasi-experimental pre- and posttest design/2c	Junior-level baccalaureate nursing students (n = 23)	Concept Mapping (CM) Students created visual diagrams to represent nursing care plans, including: • Client's health concerns • Nursing diagnoses • Subjective/objective data • Interventions and outcomes • Evaluation and teaching strategies The maps emphasized relationships between concepts and were used in pre- and post-clinical discussions.	Conceptual maps	Improved diagnostic reasoning and care planning • Students demonstrated better ability to identify patterns and relationships in client care. • 21 out of 23 students expressed satisfaction with concept mapping as a learning strategy. • Students felt it helped them understand complex community health situations and improved critical thinking .	• Evaluation of the Concept Maps • Satisfaction and Self-Assessment of Learning Questionnaire

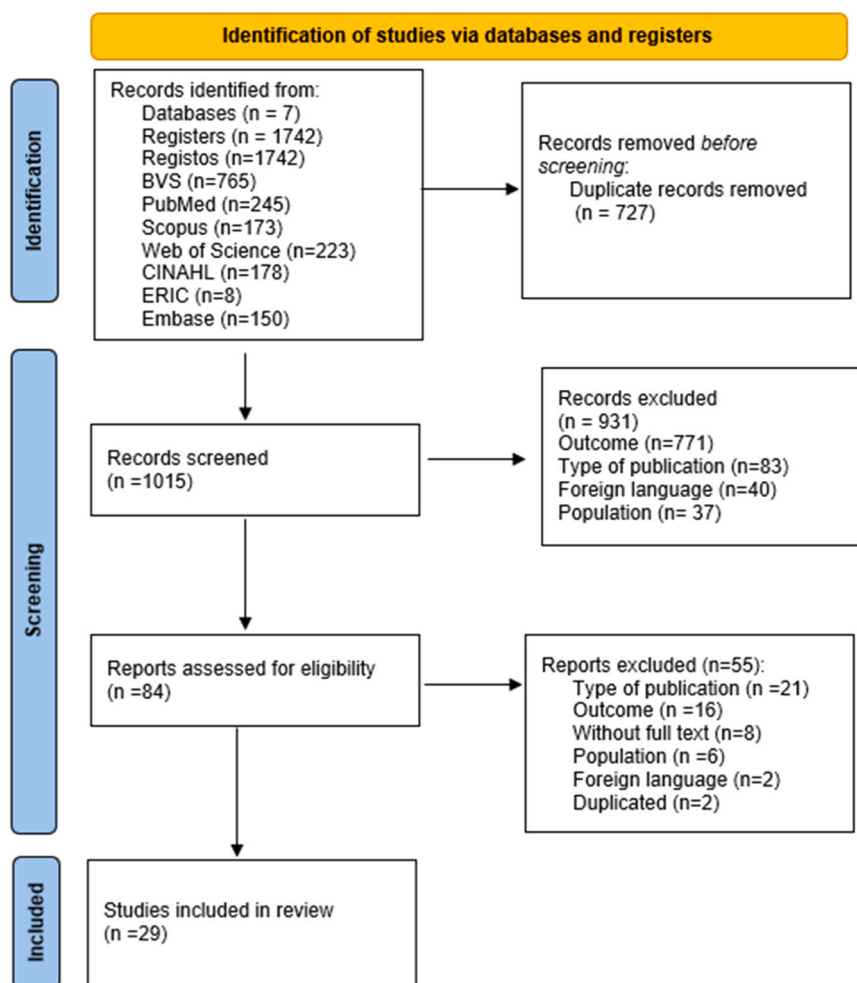


Fig. 1. Flowchart of inclusion studies (Page et al., 2021).

with students demonstrating improved diagnostic precision through peer interaction (Abbasi et al., 2017; Lenopoli et al., 2022).

Case study approaches supported the development of clinical reasoning and problem identification (Bertocchi et al., 2024; Palese et al., 2008), while other methods such as board game (Tinôco et al., 2023), the Outcome-Present State test model (Ibáñez-Alfonso et al., 2019), guided visual metaphors (Jeffreys, 1993) and the Arch method (Nakati et al., 2000) contributed to conceptual clarity, reflective practice and increased student motivation.

Across all categories, the outcomes, in general described the use of active, student-centered methodologies in promoting diagnostic reasoning, critical thinking and educational engagement. In Table 2, we identified in bold the outcomes that were explicitly related to the promotion of these competencies. Only one did not identify the intended outcomes in the intervention group (Maurício et al., 2022). However, the authors highlighted two possible explanations: the instrument was applied only once and the students experienced difficulty differentiating between similar nursing diagnoses (Maurício et al., 2022). We also sought to identify how these outcomes were measured. Across the studies, we found that different instruments were used, some of which were validated tools, while others were researcher-developed instruments created specifically for each study. In several cases, the measurement of outcomes was explicitly described, whereas in others, the outcomes were assessed implicitly, without a clearly defined or standardized measurement tool (Table 2).

4. Discussion

The results of this scoping review illustrate the variety of strategies employed in teaching diagnostic reasoning, all of which are situated within the context of active learning methodologies. Among the 29 studies included, simulation (n = 7; 24.1%) and the use of virtual tools (n = 6; 20.7%) were the most common, followed by educational programs (n = 6; 20.7%), group work (n = 3; 10.3%), case studies (n = 3; 10.3%) and other methods (n = 4; 13.8%) (Table 3). This diversity reflects the academic community's efforts to pursue student-centred approaches described as supporting the cognitive and reflective competencies essential for the diagnostic process.

Among all identified teaching strategies, simulation was the most frequently represented category. Nearly one-quarter of studies involving simulations which reflects the consolidation of this methodology within the literature as one that is described as supporting the development clinical reasoning. Simulation allows students to experience real care situations within a controlled, safe environment that encourages constructive errors (Sim et al., 2022; Verkuyl et al., 2024). Furthermore, it fosters decision-making, analytical reasoning and integration of theoretical knowledge with clinical practice. Recent research has demonstrated that both realistic and virtual simulations enhance students' diagnostic accuracy and reflective capacity (Dekhtyar et al., 2022; Kiegaldie and Shaw, 2023).

The use of virtual tools has emerged as a promising strand of active learning methodologies. Digital platforms, virtual patients and augmented reality environments are describing as promoting

Table 3
Characterization of the included studies with respective categories.

Year	Strategy	Category	Author Country
2024	Computerized system versus a traditional paper-based approach (clinical cases)	Case Studies	(Bertocchi et al., 2024) Italy
2024	Simulation-Based Learning Scenario	Simulation	(Oliveira Silva et al., 2024) Brazil
2024	Training based on students' learning styles	Group Work	(KURTGÖZ et al., 2024) Turkey
2023	Virtual Game Simulation	Simulation	(Ordu and Çalışkan, 2023a) Turkey
2023	Board game	Other	(Tinoco et al., 2023) Brazil
2023	Virtual Gaming Simulation	Simulation	(Ordu and Çalışkan, 2023b) Turkey
2023	Web-based Nursing Process Program	Educational Program	(Ayten et al., 2023) Turkey
2023	APP — Virtual Nursing Diagnosis	Virtual tools	(Bustami et al., 2023) Indonesia
2022	Self-instructional Guide for Clinical Reasoning	Educational Program	(Maurício et al., 2022) Brazil e United States
2022	Peer Learning Intervention	Group Work	(Lenopoli et al., 2022) Italy
2021	Diagnostician Nurse mobile app using virtual clinical simulation + PBL	Simulation	(Tinoco et al., 2021) Brazil
2019	Outcome Present State Test	Other	(Ibáñez-Alfonso et al., 2019) Colombia
2018	28-hour course	Case Studies	(Karaca and S, 2018) Turkey
2017	Buzz group	Group Work	(Abbasi et al., 2017) Iran
2016	Moodle	Virtual tools	(Avelino et al., 2016) Brazil
2016	Software called Wise Nurse	Virtual tools	(Sousa et al., 2016) Brazil
2016	Web-based nursing process program	Educational Program	(Kim and Jung, 2016) South Korea
2015	Virtual Learning Object	Simulation	(Costa and Luz, 2015) Brazil
2013	Diagnostic accuracy evaluation using fuzzy logic-based decision support tool	Virtual tools	(Lopes et al., 2013) Brazil
2012	Software name: <i>Fuzzy Kitten</i>	Virtual tools	(Jensen et al., 2012) Brazil
2011	Virtual Patients	Simulation	(Forsberg et al., 2011) Sweden
2009	Program of 4 h (Triple Jump Assessment)	Education Program	(Lee and Brysiewicz, 2009) South Africa
2008	Case study + laboratory session	Case Studies	(Palese et al., 2008) Italy
2007	Extracurricular classes/ Practical application	Educational Program	(Silva et al., 2007) Brazil
2006	Conceptual maps	Virtual tools	(Hinck et al., 2006) United States

Table 3 (continued)

Year	Strategy	Category	Author Country
2002	Patient Simulation via PatientSim System	Simulation	(Wong and Chung, 2002) China
2000	Arch Method	Other	(Nakati et al., 2000) Brazil
1996	Theoretical and practical	Educational Program	(Carvalho et al., 1996) Brazil
1993	Guided Visual Metaphor	Other	(Jeffreys MR, 1993) United States

autonomous learning and student engagement (Fu et al., 2024; Verkuy et al., 2024). These resources enable simulations of complex clinical scenarios, remote access and immediate feedback, thereby expanding the reach of education and allowing personalization according to the student's pace. Recent studies have shown that the use of virtual simulations significantly improves students' diagnostic competence and confidence in formulating clinical hypotheses (Fernández-Alcántara et al., 2025; Fink et al., 2023).

The identified educational programmes also fall within active learning methodologies, as they engage students in the participatory processes of knowledge construction. Courses structured to develop clinical reasoning have positive impact on analytical, judgement and decision-making skills (Kulkarni et al., 2025; Leal et al., 2024). The combination of theoretical activities, reflective practice and group discussions reinforces the principles of meaningful learning and the internalization of cognitive processes related to diagnoses.

The COVID-19 pandemic significantly disrupted traditional nursing education, prompting the adoption of active technological methodologies for teaching nursing diagnosis. The implementation of these methodologies appears to have reflected in nursing education, particularly in the instruction of nursing diagnostic reasoning. In this scoping review, 38% of the articles published between 2020 and 2024 reflect the need for alternative strategies. Park highlighted that, throughout the pandemic, nursing education was conducted through online programs, which led to substantial changes in guidance methods, assessment strategies, task allocation and evaluation processes (Park, 2025).

The studies analysed reflect the importance of active methodologies as a structuring axis for teaching diagnostic reasoning. Engaging students in practical situations, mediated by technology or social interaction, can transform knowledge from merely informative to formative, significantly contributing to the consolidation of clinical reasoning in complex and uncertain contexts (Williams et al., 2024).

When observing the description of the outcomes of using the different strategies, although positive outcomes are predominant, there is considerable methodological heterogeneity among the studies. Variations in research design, intervention duration, sample characteristics and assessment instruments hinder direct comparisons and limit the generalizability of findings. Such diversity reflects the inherent flexibility of active methodologies but underscores the need to standardize evaluation criteria for diagnostic reasoning (Pérez-Perdomo and Zabalegui, 2023; Yanagita et al., 2023).

Regarding the analyzed studies, only a few cases examined the long-term effects of the interventions, their impact on actual clinical practice and the transfer of competencies to professional settings. Several studies suggest that investigating larger and multicentric samples, using mixed methodologies and longitudinal assessments, may be an important factor (Kulkarni et al., 2025; Leal et al., 2024). One study that did not obtain favourable outcomes with the use of the strategy suggested, student's difficulty in differentiating between similar nursing diagnoses as a key limitation (Maurício et al., 2022). This ability is essential for nursing students, as it strengthens their clinical reasoning and enhances

decision-making (Miguel et al., 2022).

Limitations

We included only primary studies, which may be considered a limitation of this review, given that we consider that opinion articles, letters to the editor and secondary research (reviews) would not meet our objective in terms of data extraction. However, according to the JBI (Aromataris et al., 2024), from the perspective of sources of evidence, researchers may decide to include any type of evidence source, provided that this decision is clearly stated. The exclusion of studies due to lack of access to the full text, despite efforts such as assistance from a librarian and direct contact with authors through platforms such as ResearchGate, can also be considered a limitation. We consider this limitation to be not having conducted the lack of research in grey literature and the references from the eligible articles were not searched.

Another limitation of this review is the absence of standardized outcome measures across the included studies. Key constructs, such as diagnostic reasoning, diagnostic accuracy, documentation quality and student engagement, were defined and assessed using diverse instruments, ranging from validated tools to researcher-developed measures with limited psychometric information. In several studies, outcomes were evaluated implicitly or without a clearly described measurement approach. This heterogeneity restricts comparability across studies and limits the ability to synthesize findings or identify patterns regarding the impact of specific teaching strategies on students learning outcomes.

5. Implications for nursing education

This scoping review provides structured evidence to identify the pedagogical strategies used to teach nursing diagnoses in undergraduate education, providing a foundational basis for informing and guiding future research in the field.

This synthesis informs educators and educational institutions about the main teaching strategies used in nursing diagnosis education, aiming to foster learning environments that may promote clinical reasoning and support safe evidence-based decision-making.

The consistent improvement in diagnostic reasoning and accuracy observed across active learning strategies suggests that graduates exposed to these methodologies may be better prepared to provide safe, evidence-based care. By encouraging critical thinking and reflective judgement, these approaches are described as supporting more accurate nursing diagnoses, enhancing patient outcomes and interdisciplinary work.

In nursing education, the review presents the value of integrating student-centered strategies into curricula, such as simulations, virtual tools and case-based learning.

These methods are reported as supporting the development of diagnostic competence while also encouraging student engagement and motivation throughout the learning process.

6. Conclusion

By analyzing 29 primary studies published over three decades (1993 – 2024), involving 1797 undergraduate nursing students, this review identifies six major categories of teaching strategies—simulation, virtual tools, educational programs, group work, case studies and other innovative approaches—and describes their outcomes.

This scoping review presents the diversity and evolution of pedagogical strategies used to teach nursing diagnoses to undergraduate students over the past three decades. The findings, composed exclusively of primary studies, demonstrate the exploration of active, student-centered methodologies, particularly simulation and virtual tools, whose outcomes are described in terms of diagnostic reasoning, documentation quality and student engagement. In studies that identified educational programs and group work as teaching strategies for nursing diagnoses, collaborative learning and conceptual understanding were

observed as results. Other approaches, including gamification and visual metaphors, further enrich the learning experience by fostering motivation and reflective practice. Overall, the evidence points to the integration of dynamic and interactive teaching strategies to enhance the development of diagnostic competencies in nursing education.

Future research should standardize outcome measures, explore longitudinal impacts of these strategies and assess their scalability across various educational contexts. Strengthening the pedagogical foundation for nursing diagnoses is essential not only for academic success but also for ensuring safe, evidence-based clinical practice.

This structured overview can inform the development of future systematic reviews focused on specific pedagogical approaches, guide the design of intervention studies aimed at improving diagnostic reasoning and support the creation of standardized evaluation frameworks for diagnostic reasoning.

The diversity of study designs and outcomes highlights the need for more standardized evaluation tools and longitudinal studies. Future research that explores the long-term impact of these teaching strategies on clinical performance and their adaptability across cultural and institutional contexts is recommended.

CRedit authorship contribution statement

Conceptualization (AN, SM, RD, and AE), Methodology (AN, SM, RD, and AE); writing - original edition (AN, SM, RD, and AE), Data collection and analysis (AN, SM, RD, and AE). Writing — reviewing (AN, SM, RD, AE, MS and BB). All authors read and approved the final version submitted (AN, SM, RD, AE, MS and BB).

Ethics statement

This research does not require ethics committee approval.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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