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Improving Clinical Reasoning Skills Through Educational Approaches in Pharmacy Students: Literature Review

Sri Rahmawati[1]*, Aliefman Hakim[1,2], Agus Abhi Purwoko[1,2], Agus Ramdani[1,3], AA Sukarso[1,3]
[1]Doctoral of Science Education Program, Postgraduate Program, University of Mataram, Mataram, Indonesia.
[2]Chemistry Education, Faculty of Teacher Training and Education, University of Mataram, Mataram, Indonesia.
[3]Biology Education, Faculty of Teacher Training and Education, University of Mataram, Mataram, Indonesia.
Corresponding author e-mail: srirahmawatifarmasi87@gmail.com.

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Abstract— This study aims to review the literature on the development of Clinical Reasoning Skills (CRS) in pharmacy students, with a focus on educational approaches that enhance essential competencies in effective patient care. Using the PRISMA methodology, a systematic search was conducted in the SCOPUS database, yielding 3,794 documents. Screening based on relevance, publication date, and language narrowed the number to 1,140 documents, which were further screened for eligibility, yielding 34 documents, of which 12 met inclusion criteria for in-depth analysis. The results showed that structured and multifaceted pedagogical methods, such as cognitive apprenticeship, team-based learning, and experiential learning in real-world settings, were effective in enhancing CRS in pharmacy students. These approaches strengthen critical thinking, problem-solving, and collaboration skills, which are essential in dealing with the complexity of patient care scenarios. In addition, the use of innovative assessment tools, such as script concordance tests, allows for reliable measurement of reasoning skills and provides targeted feedback, thereby enhancing student readiness for clinical practice. The review concludes that the integration of these learning methods into the pharmacy curriculum contributes to the development of student competencies and prepares graduates for interdisciplinary collaboration. Future research is needed to explore the long-term effectiveness of this educational strategy across contexts and examine the use of technology, such as virtual simulation, to further optimize CRS training and ensure pharmacy graduates are prepared to meet evolving health care challenges.

Keywords— Clinical reasoning skills; pharmacy education; cognitive apprenticeship; experiential learning; interdisciplinary collaboration.
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1. Introduction

Clinical reasoning skills (CRS) are increasingly recognized as a fundamental competency in pharmacy education, essential to preparing students to meet the demands of contemporary health care. These skills involve a structured approach to patient care, requiring pharmacy students to synthesize pharmacotherapy knowledge with critical thinking and problem-solving abilities [1] . As the pharmacist's role expands beyond traditional medication administration, the need for effective clinical reasoning skills becomes increasingly important. Today, pharmacists are expected not only to understand medications but also to evaluate patient conditions, identify drug-related problems, and make patient-centered decisions to optimize therapeutic outcomes [2] . This evolution in the pharmacy profession reflects broader health care trends, where pharmacists are an integral part of the interdisciplinary team, working alongside physicians, nurses, and other health care providers to improve patient care.

Integration of clinical reasoning skills into the pharmacy curriculum is thus essential to bridge the gap between theoretical knowledge and real-world application. Educational programs around the world have begun to adapt to this shift, introducing courses that emphasize the practical application of pharmacotherapy and clinical skills [3] . For example, clinical pharmacy modules, which incorporate simulations and real-life case scenarios, have shown positive results in improving pharmacy students' confidence and clinical competence [4] . Through these courses, students gain hands-on experience in clinical reasoning, enabling them to approach complex cases with a systematic thinking process that encompasses assessment, diagnosis, and intervention. Such training prepares students for a variety of clinical settings, fostering the development of competencies that are essential for the transition from academia to practice.

The importance of clinical reasoning skills is particularly evident in ensuring patient safety and effective medication management. Pharmacists who are proficient in clinical reasoning are better able to identify potential drug interactions, contraindications, and adverse effects, thereby reducing the risk of medication errors [3] . Given the prevalence of polypharmacy among patients with chronic conditions, pharmacists are often tasked with evaluating the pharmacokinetic and pharmacodynamic properties of multiple medications simultaneously. This complexity requires a deep understanding of pharmacotherapy combined with strong clinical reasoning skills to ensure safe and effective patient care [1] . Studies have shown that students who receive

training in clinical reasoning demonstrate improved performance in the clinical setting, underscoring the importance of this skill for real-world application [5] .

: In addition to improving patient safety, well-developed clinical reasoning skills empower pharmacy students to assume more substantial roles within the health care team. Pharmacists are expected to communicate effectively with other health care professionals, facilitating collaborative discussions that contribute to care planning and decision-making [2] . Clinical reasoning enables pharmacists to clearly articulate their recommendations, reinforcing their role as valued members of the health care team. This interdisciplinary collaboration is critical to providing holistic patient care, as it allows pharmacists to contribute their expertise in pharmacotherapy within the broader clinical context [1] . Consequently, clinical reasoning training not only benefits individual pharmacists but also improves the overall quality of care within the health care system.

The development of clinical reasoning skills also aligns with the need for lifelong learning and adaptability in pharmacy. The healthcare landscape is constantly changing, with new medications, treatment protocols, and evidence-based guidelines emerging regularly. Pharmacy students who develop strong clinical reasoning skills are better prepared to navigate these changes, engage in ongoing professional development and evidence-based practice [3] . This adaptability is especially important in a profession where staying abreast of current developments is essential to providing high-quality patient care [2] . As such, clinical reasoning not only serves immediate educational and clinical purposes but also supports the pharmacist's long-term career growth and effectiveness in a dynamic healthcare environment.

However, developing clinical reasoning skills among pharmacy students presents significant challenges. One major challenge is the tendency of traditional pharmacy curricula to emphasize rote memorization and theoretical knowledge over patient-centered, practical learning. Many programs rely heavily on lectures, which may not provide sufficient opportunities for students to develop the critical thinking skills needed in clinical settings [6] . This approach often leaves students feeling unprepared for practical scenarios, where clinical reasoning is required to effectively assess and manage medication-related problems. Studies have highlighted that students often struggle to apply their theoretical knowledge in real-world settings, emphasizing the need for more interactive, application-based learning methods [7] . Additionally, the lack of problem-based learning (PBL) and simulation exercises in many curricula may hinder the development of important clinical reasoning and decision-making skills [8] .

Student attitudes toward clinical reasoning training may also influence the effectiveness of the program. Some pharmacy students may lack motivation or interest in clinical roles, view clinical pharmacy as undervalued or perceive career opportunities in the field as limited [7] . These perceptions may discourage them from pursuing training opportunities that are essential for developing clinical reasoning skills. Research suggests that targeted educational interventions and mentoring can help address these attitudes, fostering a more positive view of clinical pharmacy practice and its relevance to modern health care [9] . By addressing these motivational barriers, pharmacy programs can ensure that students fully engage with training designed to enhance their clinical reasoning competency.

Given the evolving healthcare landscape and the expanding role of pharmacists, this study's focus on reviewing the literature related to clinical reasoning skills in pharmacy students is timely and important. While many studies have explored the application of clinical reasoning in medical education, research specifically focused on pharmacy students is limited [1] . As pharmacists' responsibilities continue to expand, there is an urgent need to understand how pharmacy education can effectively prepare students for this expanded role. Previous studies have shown that structured clinical reasoning training improves clinical competency and patient outcomes, suggesting that further investigation of pharmacy-specific approaches is warranted [5] .

Furthermore, a comprehensive literature review on clinical reasoning skills in pharmacy students will help identify gaps in existing research, informing the development of targeted educational strategies. Many studies emphasize the importance of clinical reasoning in promoting patient-centered care and interprofessional collaboration. However, there is a lack of consolidated evidence examining the efficacy of various teaching methods, such as PBL, simulation, and case-based learning, specifically for pharmacy students. By synthesizing current findings, this study aims to offer insights into the most effective pedagogical approaches to enhance clinical reasoning skills in pharmacy education, contributing to stronger, patient-centered pharmacy practice [2] [3] .

2. Method

Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. The aim was to examine existing research on clinical reasoning skills among pharmacy students, as this is an important area of pharmacy education with implications for patient care. The PRISMA approach provides a structured and transparent methodology that allows researchers to systematically identify, evaluate, and synthesize findings from multiple studies. In this review, the primary data source was SCOPUS (https://www.scopus.com), a comprehensive academic database that offers a broad collection of peer-reviewed research articles in the health sciences, including pharmacy, nursing, and medicine [10] .

The literature search in SCOPUS used the following Boolean search string: [("Clinical Reasoning Skills" OR "Clinical Reasoning" OR "Reasoning Skills") AND ("Pharmacy Students" OR "Pharmacy Education" OR "Pharmacy Training")]. The search was aimed at retrieving studies that specifically focused on clinical reasoning in pharmacy students, and keywords were selected to capture the broad range of terminology used in this field. The database was searched for relevant articles published up to November 5, 2024, allowing for a comprehensive view of research trends in clinical reasoning in pharmacy education. The inclusion of multiple synonyms in the search terms ensured that studies addressing different aspects of reasoning skills or educational frameworks in pharmacy training would be captured.

The PRISMA methodology consists of four main stages: identification, screening, eligibility, and inclusion. In the identification stage, the search focused on collecting all articles that fit the general criteria of clinical reasoning skills in pharmacy students from the SCOPUS database. During this phase, the search yielded a total number of documents from different years of publication. However, this review focused only on recent studies to ensure relevance to contemporary educational practice. For this purpose, the

identified documents were then narrowed down during the screening stage based on specific criteria related to document type, language, publication area, and access type.

Screening of identified documents was conducted by applying several criteria to narrow the pool of eligible articles. Only articles published in the last five years (2020 to 2024) were considered to be able to capture the latest advances and current discussions in clinical reasoning training. In addition, documents were limited to documents published in English, specifically from journal articles and proceedings, to ensure consistency in content quality. Only open access documents were included to maintain transparency and accessibility in the research process. Furthermore, only studies in health professions, nursing, and medical fields were selected to align the review with topics related to pharmacy education.

Following screening, the eligibility stage involved a more in-depth assessment to determine the alignment of each document with the specific focus on clinical reasoning skills among pharmacy students. Articles were manually reviewed, with particular attention to articles that directly explored clinical reasoning frameworks, training interventions, or educational outcomes in pharmacy students. Articles that did not specifically focus on clinical reasoning or articles with general themes outside of pharmacy education were excluded from the eligibility list. This stage ensured that only documents that had direct relevance to the topic of clinical reasoning in pharmacy were considered for inclusion, thereby increasing the thematic consistency of the review.

In the final inclusion stage, eligible articles were selected based on their alignment with the study objectives, specifically those that included empirical data or thematic reviews on clinical reasoning in pharmacy students. Thus, inclusion criteria were narrowed to academic journal articles and review articles that explicitly addressed clinical reasoning training in pharmacy education. Exclusion criteria were applied to exclude articles outside the scope, such as those that focused on multiple healthcare professions with no direct implications for pharmacy education. Included articles were organized by author, year of publication, title, and study results. This organization allowed for a structured presentation of findings and facilitated analysis of trends and gaps in the literature.

Data extracted from included articles were analyzed to identify key themes and significant findings relevant to clinical reasoning training in pharmacy education. This involved a detailed examination of the study methodologies, thematic focus areas, and outcomes highlighted in each study. Data visualization techniques, including a print screen of SCOPUS search results, were used to illustrate the breadth and scope of the literature reviewed. The contribution of each article was assessed based on its relevance to the study objective of synthesizing current strategies and identifying effective pedagogical approaches for the development of clinical reasoning skills among pharmacy students. This systematic organization and analysis was essential to achieving the review objective of providing a comprehensive insight into the role of clinical reasoning training in pharmacy education.

3. Results and Discussion

The systematic literature review followed the PRISMA framework, with stages of identification, screening, eligibility, and inclusion ensuring a focused and comprehensive approach to gathering relevant studies on clinical reasoning skills in pharmacy students. Each stage yielded specific insights into the breadth and depth of research in this area, resulting in the selection of 12 core studies for in-depth analysis.

At the identification stage, an extensive search on SCOPUS yielded 3,794 documents spanning the years 1970 to 2024, as illustrated in Figures 1 to 4. This dataset includes a diverse range of publications discussing various aspects of clinical reasoning across various disciplines of pharmacy education and healthcare.

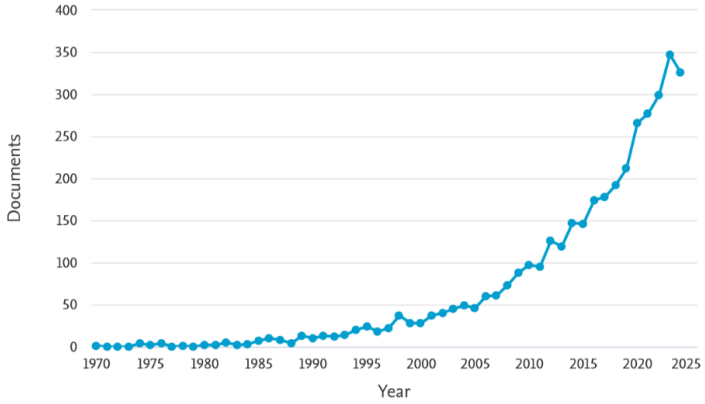

Figure 1. Distribution of documents by year

Figure 1 illustrates the annual distribution of documents, which shows a significant increase in research volume over the past decade, reflecting the growing academic interest in clinical reasoning as an educational and practical competency. Figure 2 categorizes documents by source and highlights the prominence of certain journals in pharmacy education and healthcare as major contributors to the field. Additionally, Figure 3 categorizes documents by type, emphasizing a mix of research articles, reviews, and conference proceedings, while Figure 4 displays subject area, demonstrating the interdisciplinary nature of clinical reasoning studies, with substantial contributions from health professions, medicine, and pharmacy education.

In the screening stage, the initial dataset was refined based on criteria targeting publication date, document type, language, and accessibility. Restricting the search to the period 2020–2024 resulted in 1,140 documents that were more in line with current advances and trends in clinical reasoning education for pharmacy students. This step was important to maintain relevance to contemporary educational practices. Furthermore, documents were restricted to journal articles and conference proceedings in English, which ensured consistency in quality and allowed for thorough understanding and analysis. In addition, the focus on open access articles facilitated transparency and ensured that the selected studies were available for future research and reference.

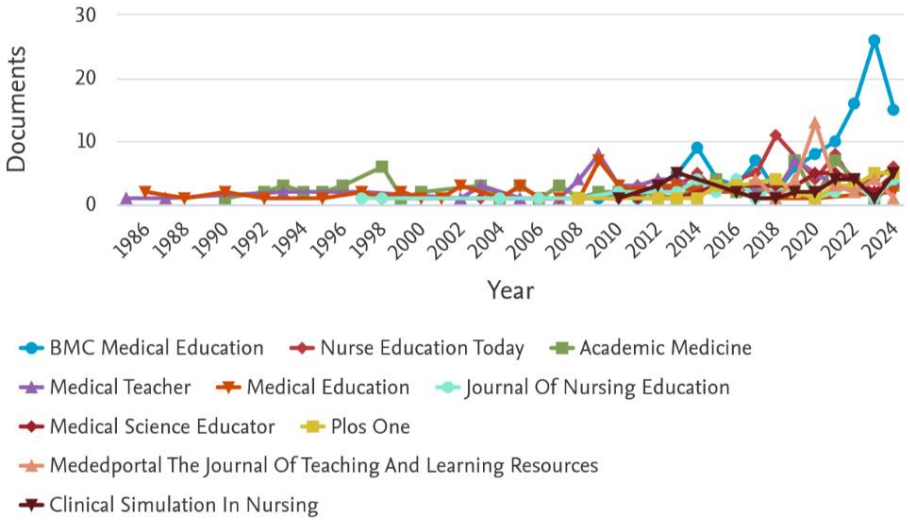

Figure 2. Distribution of documents per year based on their sources

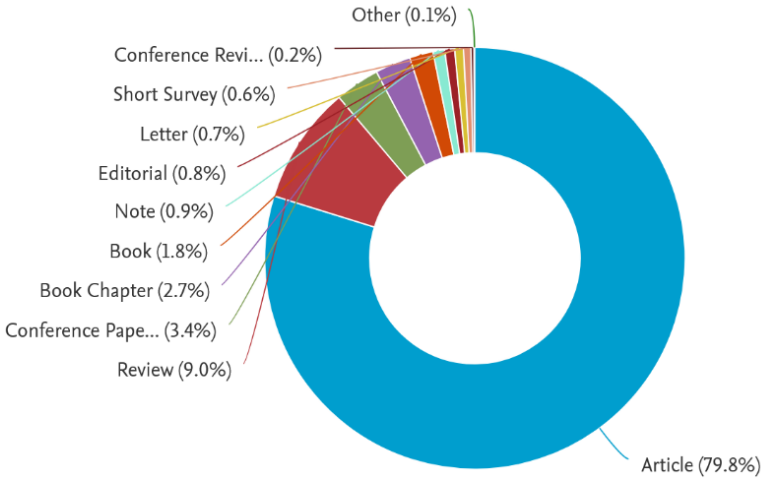

Figure 3. Distribution of documents by type

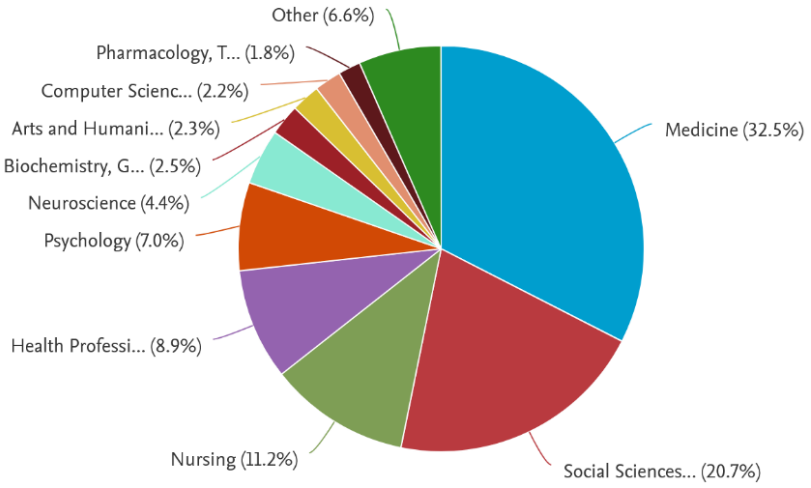

Figure 4. Distribution of documents by subject area

The eligibility stage involved a detailed review to determine each document's specific alignment to the topic of clinical reasoning in pharmacy students. During this stage, articles were manually reviewed to verify their relevance based on thematic focus. Of the 1,140 documents screened, 34 articles met the detailed eligibility criteria. These criteria included a focus on educational interventions, frameworks, or outcomes related to clinical reasoning specifically in pharmacy education. Articles that did not have a direct emphasis on clinical reasoning skills or focused exclusively on other health care areas were excluded. This refinement process ensured thematic consistency and relevance, aligning the review with the study's goal of understanding pedagogical approaches in pharmacy education that support clinical reasoning.

The inclusion stage culminated in the selection of 12 articles deemed most relevant for in-depth analysis, as outlined in Table 1.

Table 1. Research related to the theme of clinical reasoning skills in pharmacy students.

Author & Year	Title	Study Results
Shabanowitz et al ., 2024 [11]	Student Pharmacists Provide Clinical Reasoning Feedback of Equal Quality to Resident Teaching Assistants.	Pharmacy students demonstrated comparable quality of clinical reasoning feedback to resident assistants, suggesting that peer feedback can be a valuable tool in training.
Nelson and Rhoney, 2024 [12]	The use of clinical reasoning scaffolding documents improves student performance.	Students who used scaffolded documents demonstrated marked improvements in clinical reasoning skills, leading to better diagnostic accuracy and intervention selection.
Robbins et al., 2024 [13]	Assessing the Impact of Cognitive Internship on Clinical Reasoning in Third Year Pharmacy Students.	The cognitive apprenticeship approach enhances third-year students' clinical reasoning skills, with increased confidence and critical thinking during clinical scenarios.
Zagar et al ., 2023 [14]	Pharmacy students' perceptions of clinical reasoning development through a fundamental thinking application framework.	Students reported positive changes in their understanding and application of clinical reasoning, with increased readiness For breakdown patient - centered problems .
Nelson and Rhoney, 2023 [15]	Expert Feedback Analysis to Determine Intellectual Standards for Clinical Reasoning Development of Pharmacist Students.	This study identified core intellectual standards for clinical reasoning, which help refine curriculum standards to enhance reasoning competency in pharmacy students.
Newsom et al., 2022 [16]	Improving the “What” and “Why” of Pharmacists’ Patient Care Process with the “How” of Clinical Reasoning.	Integration of clinical reasoning into the patient care process enhances students' ability to relate pharmacotherapy knowledge to patient assessment, thereby improving patient outcomes.
Newsom et al., 2022 [17]	Development of a script concordance test to assess clinical reasoning in the pharmacy curriculum.	The script concordance test is effective in evaluating students' clinical reasoning and is recommended as a reliable assessment tool in the pharmacy curriculum.
Silberman et al., 2021 [8]	The impact of team-based learning on critical thinking skills of pharmacy students.	Team-based learning significantly improves students' critical thinking skills, fostering better collaboration and problem solving in the context of clinical reasoning.
Dy-Boarman et al., 2021 [18]	Faculty preceptor strategies for teaching clinical reasoning skills in an advanced pharmacy practice experience setting.	The faculty preceptor mentorship approach had a positive impact on the development of students' clinical reasoning, with students demonstrating improved patient care planning.
Bryant et al., 2021 [19]	Use of script concordance testing to evaluate the impact of targeted educational strategies on clinical reasoning in experimental advanced pharmacy practice students.	Targeted educational strategies improve clinical reasoning accuracy among students, with script appropriateness testing providing valuable feedback on decision-making skills.
Foppa et al., 2021 [20]	Teaching and Learning Pharmaceutical Services: Teaching Methods to Develop Competencies in Patient Centered Care Through Learning Based on Real Workplace Experience .	Students who participate in experiential learning in real workplaces demonstrate increased competency. in patient - centered care , improving their clinical reasoning and empathy.

Author & Year	Title	Study Results
McCartney & Boschman , 2020 [21]	Evaluation of an intervention to support the development of clinical problem-solving skills during a hospital-based experiential learning programme for South African pharmacy students.	This hospital-based program successfully enhances students' problem-solving and clinical reasoning skills, preparing them for real-world clinical practice.

The studies listed in Table 1 cover a variety of methodologies and focus areas in advancing clinical reasoning skills among pharmacy students, providing insights into effective pedagogical approaches, barriers, and outcomes. Collectively, these studies reveal important strategies for integrating clinical reasoning into pharmacy education, contributing to a comprehensive understanding of how such training impacts students' competency and preparedness for real-world healthcare roles.

One of the key findings of the reviewed studies was the effectiveness of scaffolding and structured tools in improving clinical reasoning skills. The positive impact of scaffolding documents on clinical reasoning development, where structured templates guided students through the diagnostic process and decision-making steps. This approach supports a step-by-step learning framework that strengthens reasoning skills, ultimately resulting in greater diagnostic accuracy and more appropriate intervention choices. These findings are consistent with educational theory that advocates structured guidance in skill acquisition, particularly in complex areas such as clinical reasoning [12] .

Another important method observed was the use of cognitive apprenticeship models. The role of cognitive apprenticeship in clinical reasoning among third-year pharmacy students, concluded that mentoring and modeling are powerful tools for fostering reasoning skills [13] . Through hands-on, mentor-led exercises, students not only build technical knowledge but also develop critical thinking and problem-solving skills, skills that are transferable to a variety of clinical contexts. This approach mirrors real-life clinical settings, where mentoring and role modeling are integral to learning, making cognitive apprenticeships particularly useful in bridging classroom learning with professional practice.

The importance of feedback mechanisms, particularly through peer-based learning, was another important theme. Feedback provided by pharmacy students was comparable in quality to that provided by resident teaching assistants, underscoring the importance of peer feedback in clinical reasoning education. These findings suggest that peer-to-peer interactions may play a critical role in clinical training, potentially enabling a scalable model in which students learn collaboratively. Peer feedback encourages self-reflection and critical evaluation, core components of clinical reasoning that enable students to internalize and improve their judgment skills [11] .

Team-based learning (TBL) has also emerged as an effective strategy for enhancing reasoning skills. TBL facilitates critical thinking and collaboration, which are essential for clinical reasoning. In team-based scenarios, students learn to evaluate multiple perspectives and collaboratively reach optimal clinical decisions. This approach is particularly relevant for preparing pharmacy students to work in interdisciplinary health care teams, where effective communication and collaborative problem solving are paramount [8] .

In addition, experiential learning in real-world settings has been shown to be essential for developing patient-centered competencies. Teaching methods that integrate experiential learning, which allows students to apply clinical reasoning in real-world workplace settings, need to be evaluated. Findings suggest that students who engage in such learning experiences demonstrate increased empathy and patient-centered care skills. This is consistent with broader educational theory that states that immersive real-world experiences enhance learning retention and practical application, making experiential learning indispensable in the development of clinical reasoning [20] .

Several studies have highlighted innovative assessment tools that objectively measure clinical reasoning progress. The use of script concordance tests (SCTs), provides a reliable method for assessing students' clinical judgment and decision-making skills under uncertainty. SCTs measure the consistency of students' responses with those of experienced clinicians, offering insight into their ability to handle ambiguous clinical scenarios. This form of testing is valuable for identifying reasoning strengths and areas for improvement, making it an important component in tracking the effectiveness of clinical reasoning curricula [17] [19] .

Challenges in traditional pharmacy curricula emerge as barriers to effective clinical reasoning training. Studies such as those conducted by Dy-Boarman et al. (2021) and Farahani et al. (2020) note the tendency of traditional curricula to emphasize memorization over critical thinking, resulting in students who are less prepared for practical, patient-centered care. Farahani et al. highlighted that active learning methods such as problem-based learning (PBL) and case-based exercises are more effective in fostering reasoning skills than lecture-based instruction. Therefore, these findings advocate for curriculum reform that prioritizes interactive and application-based learning, which is in line with modern pedagogical approaches that enhance critical thinking [6] [18] .

From a curriculum design perspective, faculty mentorship and guidance have been identified as critical factors in effective clinical reasoning education. Faculty mentors who are actively involved in mentoring students in clinical reasoning have a significant impact on student learning outcomes. Faculty mentorship allows for individualized guidance and contextual feedback, which are critical to mastering complex reasoning processes. These findings underscore the need for specialized mentor training programs that equip faculty with the skills necessary to effectively foster clinical reasoning in students [18] .

Another important finding in the literature is the role of student perceptions and attitudes toward clinical training. Pharmacy students' perceptions of the clinical reasoning framework, noted a positive shift in understanding and applying clinical reasoning.

Such studies highlight that fostering positive student attitudes toward clinical training can significantly impact engagement and outcomes. By actively promoting the relevance of clinical reasoning and creating a supportive learning environment, educators can increase student engagement, which is critical to the success of clinical training initiatives [14] .

The study also emphasized the multifaceted nature of clinical reasoning skills, which include elements of problem solving, decision making, and critical thinking in the context of complex and dynamic patient care. Each pedagogical approach reviewed contributed to different aspects of reasoning development. For example, stepwise learning primarily assisted in structuring thought processes, while cognitive apprenticeship offered experiential learning through direct guidance. Team-based and experiential learning approaches emphasized collaboration and real-world application, fostering a comprehensive set of skills essential for effective reasoning in clinical practice.

Overall, the analysis of these 12 studies suggests a consensus that a combination of structured learning tools, experiential opportunities, collaborative models, and consistent feedback best supports the development of clinical reasoning in pharmacy students. Future research could explore the longitudinal impact of these training methods on pharmacy practice, as well as the comparative effectiveness of different pedagogical combinations across educational settings. Such research would provide further insight into refining and optimizing clinical reasoning education, contributing to stronger, patient-centered pharmacy practice.

In conclusion, this review highlights the critical role of clinical reasoning training in pharmacy education and highlights evidence-based methods that enhance student competency. Implementing a multi-method approach that includes cognitive apprenticeship, incremental learning, team-based exercises, and real-world experiences appears to be most effective. These strategies collectively address the complex nature of clinical reasoning and prepare pharmacy students to contribute effectively to patient care and interdisciplinary health care teams. Through targeted curricular enhancement, pharmacy programs can cultivate well-rounded practitioners who are equipped to address contemporary health care challenges.

4. Conclusion

This literature review has examined key pedagogical strategies and challenges in developing clinical reasoning skills among pharmacy students, highlighting the importance of structured training methods. Findings suggest that a multifaceted approach that incorporates cognitive apprenticeship, team-based learning, step-by-step instruction, and experiential opportunities in real-world settings is highly effective in fostering this competency. Such educational strategies not only strengthen students' clinical judgment and decision-making skills but also equip them to navigate complex, patient-centered care environments. Furthermore, tools such as script concordance tests offer valuable feedback mechanisms, allowing students to refine their reasoning in ambiguous clinical scenarios, thereby enhancing readiness for practical application.

As pharmacists' responsibilities continue to expand in modern healthcare, this study underscores the need for curriculum innovations that emphasize clinical reasoning in pharmacy education. The study findings advocate for a more integrated curriculum that prioritizes active learning, critical thinking, and mentorship, preparing students for collaborative roles on interdisciplinary healthcare teams. Future research could explore the longitudinal impact of this training method on clinical competency, offering insights to further optimize curriculum design. Through targeted improvements in clinical reasoning education, pharmacy programs can contribute to producing highly competent and adaptable practitioners, thereby improving patient safety and overall healthcare quality.

Confession

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