Advances in Medical Education and Practice

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Impact of Case-based Learning on Critical Thinking in Clinical Decision-making Among Student Nurses of Kampala International University, Uganda

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Background: Case-based learning (CBL) is a student-centered pedagogy that introduces students to real-life scenarios by presenting an authentic case, mirroring situations encountered in clinical practice. It serves as a bridge between theoretical knowledge and practical applications in nursing practice, fostering development of critical thinking skills in clinical decision-making by providing practical and immersive learning experiences to students. This study examined the impact of CBL on critical thinking in clinical decision-making among student nurses at Kampala International University (KIU), Uganda.

Methodology: -The study used descriptive design with criterion purposive sampling. 28 students nurses consented and participated in the study. The procedure involved CBL pedagogy, implemented using framework for teaching that was adopted and adapted by researchers and prepared instructional content on "Anemia in Pregnancy". The instrument for data collection was the California Critical Thinking Skills Test (CCTST) questionnaire (34-point scale). Collected data were analyzed using percentages, descriptive statistics and ANOVA for sub-scale scores with a significance *P*-value of <0.05.

Results: Very few (7.1%) participants had strong, whereas majority (92.9%) had superior overall CCTST scores. Participants' CCTST total mean score was 27.39, sub-scale analysis 5.79, evaluation 3.96, inference 5.64, deductive reasoning 5.54, and inductive reasoning 6.46 as their mean scores. CBL was a statistically significant factor influencing participants' scores in analysis (P =0.016), evaluation (P =0.007), and deductive reasoning (P =0.025) but did not have a statistically significant effect on inference (P =0.932) or inductive reasoning (P =0.670) sub-scale scores.

Conclusion: As a pedagogy, CBL has an excellent impact on KIU student nurses' critical thinking in clinical decision-making, as shown by study findings. However, there is a need to use more than one student-centered pedagogy to transfer adequate knowledge in curriculum to student nurses and strengthen clinical teaching to enhance their clinical management skills were recommended.

Keywords: case-based learning, critical thinking, clinical decision, student nurses, nursing education

Introduction

Nursing education is a crucial component of the health-care system that aims to produce competent, skilled, and compassionate nurses who can effectively contribute to patient care and address the diverse health-care needs of the population. In Uganda, nursing education system typically follows a structured curriculum designed to impart theoretical knowledge, practical skills, and ethical values essential to nursing practice.[1] The programs are governed by regulatory bodies such as the Uganda Nurses and Midwives Council (UNMC) as well as the Ugandan National Council for Higher Education, which set standards and guidelines for nursing education institutions.[2] Nursing training programs often include a combination of theoretical classroom learning and hands-on clinical training.[3] Practical training and clinical rotation in various health-care settings are crucial components of nursing education in Uganda.[4] Its curriculum outlines

Received: 15 June 2025
Accepted: 30 September 2025
Published: 11 October 2025

various teaching pedagogies, such as lectures or didactic teaching, simulation-based learning, case-based learning/case studies, and problem-based learning (PBL), aimed at providing comprehensive learning experiences for aspiring nurses.[5–7] It places a strong emphasis on developing essential skills, such as critical thinking, patient assessment, clinical decision-making, therapeutic communication, and evidence-based practice.[8,9] These skills are vital for nurses to deliver high-quality care and make informed clinical decisions in nursing practice. Musiime[10] reported that the traditional (lecture) method is the most used teaching method in Ugandan universities, while case-based learning (CBL) is the most effective teaching method in enhancing student performance, with a prediction potential of 71.1% compared to lecturing, concluding that student performance is a reflection of skills that emerge from the instruction. Globally, studies revealed use of CBL pedagogy is limited in Africa. McLean[11] reported use of CBL based on global review articles; 54.9% for North America, Europe (25.4%), Asia (15.5%), South America (2.8%) and Africa (1%). Tsekhmister[12] in meta-analysis on worldwide use of CBL to other teaching methods for professional student teaching revealed selected studies conducted in USA, 33%; China, 24%; Germany and Saudi Arabia 9% while no studies were found in Africa.

Case-based learning (CBL) is a student- or learner-centered pedagogy that introduces students to real-life scenarios. It engages students in discussions of patients or clients' cases, integrated with clinical presentations and health or illness conditions.[13] CBL plays a significant role in enhancing critical thinking skills in clinical decision-making in nursing education by providing practical and immersive learning experience.[14] CBL presents authentic scenarios and mirroring situations encountered in clinical practice. Students engaged in realistic patient situations, applied theoretical knowledge and decision-making to solve problems. The effectiveness of CBL allows students to gain professional knowledge to become competent in clinical decision-making and the provision of qualitative care to improve patient care outcomes. CBL serves as a bridge between theoretical knowledge and practical applications in real-life cases,[15] offering students the opportunity to engage in actual clinical cases in a controlled educational environment. Like many others globally, Uganda's health-care system demands nurses that swiftly analyze complex situations, make informed decisions, and provide effective patient care.[16] CBL enables student to apply their theoretical knowledge to simulated or authentic patient cases, thereby enhancing their understanding of complex concepts.

Frederic Le Play (1829) introduced CBLinto social science during a statistical study of his family budget.[17] In 1870, Professor Christopher Columbus Langdell at Harvard University School of Law developed a case study method based on the cognitive influence of inductive experimentation to create learning methods which was legally adopted by the USA as a teaching method.[18] CBL was first used in the medical field in 1912 by Dr James Lorrain Smith when teaching pathology at Edinburgh University.[11] In the 1990s, CBL was used synonymously with case-based reasoning, which Kolodner (1993) explained as reasoning based on remembering past experiences, and is widely used in psychiatric diagnoses as well as medical education.[19]

CBL refers to the use of clinical cases to facilitate students' teaching and learning. Obeagu et al[20] Gasim et al[21] noted that the aim of CBL is to nurture students to prepare for medical practice using real clinical cases. It joins theory with practice by applying theoretical knowledge to cases using an inquiry-based learning method. CBL as a pedagogy is a two-directional active student-centered method that encourages communication, collaboration, critical thinking, and creativity among learners with the teacher as a facilitator.[22] Collaboration helps medical students develop the spirit of teamwork, which is paramount in interprofessional team services in health-care delivery in a clinical setting. Techniques of CBL delivery include live presentations, computer/web-based, diverse modalities, live plus web, live plus book, live simulator, live/self-learning, and paper presentations. The evaluation methods for case-based learning includes surveys, tests, and tests plus survey.[11] CBL encourages critical thinking by presenting authentic, multifaceted situations that require analysis, evaluation, and problem-solving Obeagu et al.[20] Student nurses are prompted to assess data, identify patterns, consider various perspectives, and make informed decisions, thereby fostering critical thinking skills in clinical decision-making.

Critical thinking is a central competency in nursing education and practice, enabling students to engage in sound clinical reasoning and make evidence-based decisions that enhance patient outcomes. This process involves synthesizing knowledge from various sources to formulate appropriate interventions.[23] It equips students with the problem-solving skills to identify issues, evaluate alternatives, and implement solutions in a timely and efficient manner. Nurses with strong critical thinking skills are better equipped to recognize subtle changes in a patient's condition, anticipate potential

complications, and take proactive measures to ensure patient safety, which is crucial for preventing medical errors and providing high-quality care.[24] Nurses use critical thinking to appraise research findings, scientific evidence, and best practices analytically to integrate this evidence into their clinical decision-making processes, ensuring that patient care is based on the most current and reliable information available.[25] In nursing students it is the ability to apply higher-order reasoning skills in clinical decision-making. It involves purposeful, reflective judgment through which students analyze patient situations, infer possible outcomes, evaluate evidence, and justify nursing interventions. In this study, critical thinking is operationalized using the California Critical Thinking Skills Test (CCTST), a standardized tool with a 34-point total score that assesses performance across key subscales such as analysis, evaluation, inference, deductive, and inductive reasoning using multiple choice tests questionnaire. Higher scores reflect stronger critical thinking abilities, while lower scores indicate limited reasoning capacity. This study is guided by Facione's Delphi Report on Critical Thinking,[26] which provides a comprehensive framework derived from expert consensus in philosophy, education, and psychology. Facione conceptualizes critical thinking as a combination of cognitive skills (interpretation, analysis, inference, evaluation, explanation, and self-regulation) and dispositional attributes that reflects traits such as inquisitiveness, open-mindedness, systematicity, truth-seeking, and confidence in reasoning indicating it is multidimensional in nursing.[26] This framework is particularly relevant in nursing education because clinical decision-making demands both cognitive reasoning skills and professional dispositions that support safe, patient-centered care. The study aimed to investigate the impact of case-based learning as a pedagogical tool for enhancing critical thinking skills in clinical decision-making among student nurses at Kampala International University (KIU).

Materials and Methods

Study Design

Study adopted a descriptive design to collect data from 37 Bachelor of Nursing (BN) science students in the fourth academic year of their program to achieve the research objective. The entire population of 37 students was sampled, 28 consented and participated in the study.

Sampling Technique

Criterion purposive sampling was used, which depends on the researcher's judgment based on students predetermined criteria, to identify and select participants who can provide relevant answers to research questions for CBL topic "anemia in pregnancy".

Inclusion Criteria

KIU BN science students in their fourth year who have studied related courses such as reproductive health, midwifery, and participated in CBL session specifically on "anemia in pregnancy".

Exclusion Criteria

Nursing students of KIU who did not consent to participate in CBL pedagogy and those below the academic year because of non-exposure to interrelated courses on the topic of teaching intervention.

Case-based Learning Topic

The focus was on "anemia in pregnancy" as the core clinical case in classroom teaching of one CBL session for 3 h. The participants were exposed for the first time to CBL pedagogy as well as instruction topic in their training period because the study context use mostly lecturing and other methods not CBL.

Study Procedure

Implementation of CBL in classroom involve case presentations in progressive case disclosure to mimic real-life scenarios. Group work where students are divided into small groups to encourage teamwork, discussion and presentation. The teacher acts as a facilitator, guiding discussion with probing questions instead of lecturing. In this study, CBL

pedagogy was implemented using Framework for Teaching (FFT) 3rd edition by Charlotte Danielson group and lesson plan structured by researchers focusing on the topic "Anemia in Pregnancy." The four domains of FFT comprising of planning/preparation, learning environment, learning experience and principled teaching was adopted and pedagogical activities in each domains were adapted as step-by-step approach for this study (see Table 1).

Table 1 Framework for Teaching for Implementation of Case-based Learning (CBL)

Domain 1: Planning and Preparation	Prepare instructional content which is anemia in pregnancy. Prepare teaching aids. Develop assessment test in form of California Critical Thinking Skill Test questionnaire with its test items from anemia in pregnancy. Obtain permission from Dean School of Nursing with ethical approval from KIU-REC. Organize Bachelors of Nursing Science student nurses for case-based learning through class representatives. Learning objectives: At the end of this teaching with CBL pedagogy, student will demonstrate a deeper understanding of anemia in pregnancy through assessment by administration of CCTST questionnaire individually to participants.
Domain 2: Learning Environments	Creating an environment of respect and rapport to enhance teacher interactions with students/student interactions with other students including both words and action for positive relationships and sense of belonging by use of conducive classroom. Display teaching aids; poster with pictures related to instructional material, PowerPoints with questions to guide student discussion, worksheets/guides to help students structure their analysis and model as an assessment tool. Welcome students, introduce self, and explain reason for get together, explain procedure for CBL implementation and obtain informed consent, signed by participants. Organized students in focus group of minimum of six and maximum of 12 students for effective group discussion, presentation and collaboration by random numbering into three groups.
Domain 3: Learning Experiences	Case-based learning implementation in classroom as a pedagogy occurred in three phases; • Phase 1 (10 min): Introduction involving a brief overview of CBL pedagogy and presentation of contents of teaching topic or reference material for this study "anemia in pregnancy" using questions. Example: our class today involves CBL pedagogy. Patient background, signs, symptoms and examination findings will be presented. Students are expected to identify the diagnosis as the clinical case which will be discussed step by step in detail in groups. Questions from teacher will guide this teaching and learning session. Questions and answers. • Phase 2 (55 min): Provide students with prepared instructional content which is anemia in pregnancy. Students group discussion and presentation on topic of teaching intervention (anemia in pregnancy) while teacher goes around each group to facilitate active participation among group members by guiding discussion with probing questions in a progressive case disclosure by projecting and reading it out on PowerPoint presentation. Group presentations, peer discussion, questions and answers. • Phase 3 (35 min): Reflective thinking stage with case presentations. The teacher uses questioning throughout this phase, starting first with the presentation of clinical case scenario of anemia in pregnancy in progressive case disclosure. The students reflectively think to provide the answers verbally with detailed explanations of their responses. The teacher clarifies both wrong and right answers to reinforce learning. • Case presentation occurred in a progressive case disclosure, starting with patient history, examination findings and laboratory results; "Mrs Adams 29 years gravida 3, para 2, alive 2 (G3 P2 A2) mother at 24 weeks of gestation reported to antenatal clinic for routine prenatal care, with history of tiredness, dizziness on standing, cold hands and feet and shortness of breath especially upon exertion for 2 weeks. Examination show pale mucous membranes (in the mouth, eyes conjuctiva, etc), pale skin and under the fingernails, rapid breathing (respiration 26 c/b) and heart rate (pulse100 b/m) and hemoglobin estimation is 8 g/dL". • Instructors questions: What is the diagnosis of Mrs Adams? Explain in details methods to clinically evaluate Mrs Adams. Explain WHO classification of Mrs Adams condition Discuss the common types of Mrs Adams condition. What are the management options of Mrs Adams condition? Discuss the complications linked to Mrs Adams condition. Teacher uses questioning and discussion techniques to encourage student participation to promote critical thinking, deeper learning, reasoning and reflection. Engaging students in learning by encouraging activities in students groups through collaboration, teamwork, instructional materials and resources, structure and pacing to support rich learning, collaboration, and opportunities to reflect on and consolidate learning.
Domain 4: Principled Teaching	Reflecting on teaching accuracy; the researcher acts as facilitator while students were actively involved in the teaching and learning. Removal of teaching and learning materials. Assessment of teaching by students' completion of assignments through the administration of CCTST questionnaire individually to participants for 50 minutes. Appreciation and assuring participants that the information provided is strictly for academic purpose. Evaluation of teaching intervention using instructional records by marking and maintaining reliable record of CCTST questionnaire to show the impact of case-based learning as a pedagogical tool on critical thinking in clinical decision making among student nurses at KIU following data analysis, interpretation and presentation of results.

Instrument for Data Collection

The instrument for data collection was California Critical Thinking Skills Test (CCTST) questionnaire. CCTST subscales of analysis, evaluation, inference, deductive reasoning, and inductive reasoning was adopted and adapted by developing the test items in each of the five subscales from "anemia in pregnancy". CCTST total scores range from 0 to 34. The subscale scores range were analysis (0–9), evaluation (0–14), inference (0–11), deductive reasoning (0–16), and inductive reasoning (0–14). The sum of the scores of the analyses, evaluation, and inference was the total CCTST score. The inductive and deductive scales join the analysis, inference, and evaluation scales. The validity and reliability of this instrument were based on the Delphi Expert Consensus Report.[26] The Pearson correlation coefficient (r =0.68) was calculated using the test–retest method with five student nurses to test the reliability of the test items for the data collection instrument. It was administered individually to participants for 50 min in the classroom after the CBL session.

Data Analysis Method

The collected data were analyzed using percentage, distributive statistics and analysis of variance (ANOVA), with significance set at P <0.05. In addition, a qualitative interpretation of the California Critical Thinking Skill Test Scale Scores was presented with the following measures: not manifest (0–7), weak (8–12), moderate (13–18), strong (19–23), and superior (24–34). The data are presented in the tables and figures.

Results

Figure 1 shows the overall CCTST scores. It was observed that very few 2 (7.1%) participants had a strong score, while majority 26 (92.9%) had a superior CCTST score. From Table 2, participants CCTST total score reported mean value of 27.39, mode 27, median 27, and standard deviation (SD) 2.65. Sub-scale analysis mean score: 5.79, mode 6, median 6, and SD 0.9. Evaluation sub-scale graded mean score of 3.96, mode 4, median 4, and SD 0.5. Inference sub-scale recorded 5.64 mean score and 5, 6, 1.01for mode, median, and SD, respectively. For deductive reasoning, mean score was 5.54, mode and median 6 each and SD 1.24. Inductive reasoning had mean score of 6.46, mode and median 7 each, and SD 0.68. Table 3 presented CCTST sub-scales presented using ANOVA, results indicated that CBL method was

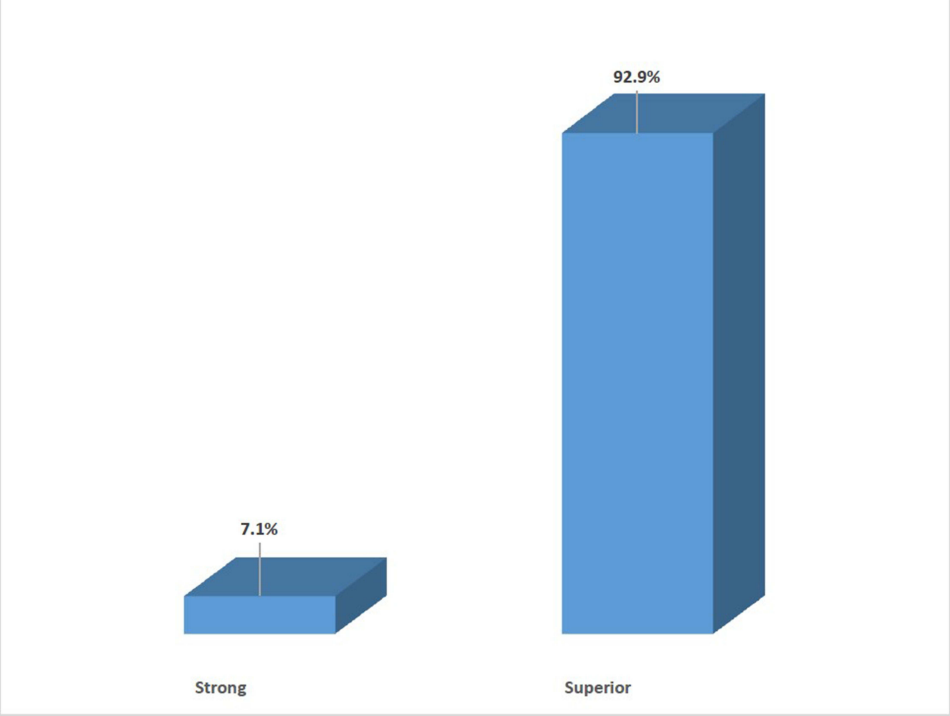

Figure 1 Qualitative Interpretation of California Critical Thinking Skill Test Overall Scores.

https://doi.org/10.2147/AMEP.S547292

Table 2 Descriptive Statistics of CCTST Total and Subscale Scores

Total/Subscale Scores	N	Mean	Mode	Median	SD
CCTST Total Score	34	27.39	27	27	2.65
Analysis	7	5.79	6	6	0.9
Evaluation	5	3.96	4	4	0.5
Inference	7	5.64	5	6	1.01
Deductive reasoning	8	5.54	6	6	1.24
Inductive reasoning	7	6.46	7	7	0.68

Table 3 Impact of Case-based Learning on Critical Thinking in Clinical Decision-making for California Critical Thinking Skill Test (CCTST) Sub-scale Scores

Variables	Sum of Squares	df	Mean Square	F	Significance
CCTST Analysis					
Between Groups	9.055	4	2.264	3.811	
Within Groups	13.660	23	0.594		0.016*
Total	22.714	27			
CCTST Evaluation					
Between Groups	3.075	4	0.769	4.547	
Within Groups	3.889	23	0.169		0.007*
Total	6.964	27			
CCTST Inference					
Between Groups	0.991	4	0.248	0.208	
Within Groups	27.438	23	1.193		0.932
Total	28.429	27			
CCTST Deductive Reasoning					
Between Groups	16.027	4	4.007	3.421	
Within Groups	26.964	23	1.171		0.025*
Total	42.964	27			
CCTST Inductive Reasoning					
Between Groups	1.214	4	0.304	0.594	
Within Groups	11.750	23	0.511		0.670
Total	12.964	27			

Note: *Statistically significant at P =0.05.

a statistically significant factor influencing participants' scores in analysis (P =0.016), evaluation (P = 0.007), and deductive reasoning (P = 0.025). However, it did not have a statistically significant effect on the inference (P =0.932) or inductive reasoning (P =0.670) subscale scores in this study.

Discussion

This study showed that CBL has an excellent impact on student nurses' critical thinking in clinical decision-making. Very few 2 (7.1%) participants had a strong score, the majority 26 (92.9%) had a superior overall CCTST score. The finding of the study were supported by Makoni[27] which revealed 98 (78.4%) student nurses and midwives were ranked in grade level 3 and 4 which is acceptable CCTST scale score and 27 (21.6%) of the respondents were graded level 1 and 2 which is very poor in the critical thinking skill test scale. In addition, Obeagu and Tukur[28] reported 13 (46.4%) of participants were proficient/safe (level 3), 12 (42.9%) had moderate/developing (level 2) while 3 (10.7%) scaled minimal/unsafe

(level 1) in pretest scores. Posttest scores revealed 13 (46.4%) respondents at excellent point (level 4), 13 (46.4%) were proficient/safe (level 3) and 2 (7.1%) had moderate/developing (level 2) in Performance-Based Development System Model (PBDSM) on levels of critical thinking in clinical decision-making of student nurses using CBL.

In addition, participants CCTST total score reported mean value of 27.39, sub-scale analysis mean score 5.79, evaluation 3.96, inference 5.64, deductive reasoning 5.54, and inductive reasoning 6.46 as their mean score values. The above findings indicated that CBL enhances student nurses' critical thinking in clinical decision-making which is in line with the work of Obeagu and Tukur,[28] the authors documented mean scores of 11.75 in pretest and 16.10 out of total score of 20 on student nurses critical thinking in clinical decision making of using CBL. Mostafa et al[29] reported that students' critical thinking skills in clinical decision-making had mean scores of 14 for lecturing and 17 for CBL in partial support of this study findings.

Furthermore, the CBL method of teaching showed a significant factor for CCTST score for the participants; analysis (0.016), evaluation (0.007), and deductive reasoning (0.025); and not a statistically significant factor for their inference (0.932) and inductive reasoning (0.670). There was no study to discuss this findings. However, CBL is a more effective method for educating student nurses to enhance their critical thinking in clinical decision-making in nursing education.

Conclusion

It was observed that CBL, as a teaching pedagogy, has an excellent impact on KIU student nurses' critical thinking in clinical decision-making, especially analysis, evaluation, and deductive reasoning. However, CBL has little impact on KIU student nurses' inference and inductive reasoning, advocating the use of more than one student-centered teaching pedagogy to transfer adequate knowledge in the curriculum to student nurses. In addition, this shows the need to strengthen clinical teaching for student nurses to enhance their clinical management skills and bridge the gap in clinical practice among nurses.

Ethical Considerations

Ethical approval was obtained from the Kampala International University Research Ethics Committee (REC number KIU-2024-424), and permission was obtained from students who provided informed consent to participate in this study. The researcher ensured that the rights, dignity, and well-being of the participants were respected by implementing ethical principles of confidentiality, autonomy, justice, and informed consent.

Disclosure

The authors report no conflicts of interest in this work.

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