Research Article

Effect of Unfolding Case Studies on Critical Thinking Dispositions and Academic Performance of Undergraduate Nursing Students

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Abstract

Background: Unfolding case study is an effective teaching strategy. It assists students to learn real-life scenarios, develop critical thinking and clinical reasoning.

Objective: To measure the effect of unfolding case studies on critical thinking dispositions and academic performance of undergraduate nursing students in the pathophysiology course.

Methods: Quasi-experimental one-group pretest and posttest design was adopted. The study was conducted at a private nursing college in Islamabad, Pakistan. Post Registered Nurse Bachelor of Science in Nursing students (n=45) were enrolled in the study with convenient sampling. Unfolding case studies were used as a strategy to teach the pathophysiology course. Academic performance was measured with short answer questions and critical thinking dispositions with a structured self-administered scale. Data were analyzed with SPSS v25.0.

Results: The sample comprised of 80% female students, and 20% were male. A 68% of them were from medical and surgical units and, 32% from critical care units. Posttest scores were significantly higher in (P-Value < 0.05) in 10 out of 11 sessions. Also, unfolding case studies produced a large Cohen's d = 3.64 effect size. Likewise, collective critical thinking dispositions mean score (P-Value < 0.05) was found increased in the posttest; expect the perseverance construct (P-Value, 0.110). The effect of unfolding case studies on critical thinking dispositions was favorably high Cohen's d = 1.40.

Conclusion: Unfolding case studies can improve academic performance and critical thinking dispositions of nursing students. Faculty competence to construct unfolding cases, facilitating the process of unfolding cases and active involvement of students is imperative for favorable outcomes.

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Keywords | unfolding case study, critical thinking dispositions, academic performance, nursing students.

Introduction

Literature revealed that nursing educators have introduced numerous teaching strategies over the past few decades.[1] This has led to a shift in the focus from traditional lecturing to interactive and student-centered pedagogical instruction. Nurse educators use multiple strategies to encourage active participation and discussion among nursing students to impart complex knowledge requiring higher-order thinking.[2] Case study is one of the active learning strategies that is used for this purpose.[3] The use of case studies is rooted deeply in nursing education. Traditional case study method involves a case scenario focusing on patient problems and

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related health concerns. Students receive a rich scenario followed by multiple questions to stimulate discussion.[4] Notably, students experience difficulties in analyzing large contextual information and express a high cognitive load.[5] As a result, they often fail to meet the faculty expectations. To mitigate such issues the traditional case study method is transformed with the combination of mini-lecture, progressive disclosure of cases, and questions referred to as the unfolding case studies. Students learn complex cases through interpersonal skills and develop a positive attitude for cooperative learning. Educators may use simulated cases close to real-life situations.[6] A progressive unfolding of the case in multiple stages facilitates the development of the situational mental model. Mental modeling aids to develop cognitive skills essential for clinical practice including identification, hypothesis testing, integration, problem-solving, critical thinking, and creative thinking.[7] A well-constructed and implemented unfolding case study could serve all these purposes.[8] Furthermore, progressive disclosure of a case allows students to respond sequentially usually in a simple to complex manner. Consequently, the cognitive overload is reduced which improves the student's ability to process more complex information after recalling facts, figures, and concepts that can be transformed into the application of the concept in a particular situation. The teacher establishes and manages a simulated environment where students can translate complex information into practical applications. Simulation-based education offers a risk-free setting for skill development, varying in fidelity levels: low, medium, and high. Low-fidelity simulations use static models, medium-fidelity includes manikins mimicking patients, and high-fidelity utilizes computerized manikins for realistic training, enhancing problem-solving abilities.[9] Unfolding case studies are developed based on real clinical scenarios and cases, prompting critical thinking, decision-making, and problem-solving.[10] Therefore, unfolding case studies have a higher student' satisfaction in high-fidelity simulation. In low-fidelity simulations, students are more inclined to engage in discussions, management, and quality assessment rather than direct skill performance. This is due to the fact that they often make assumptions about the real-world context. However, in medium and high-fidelity simulations, students are closer to an approximation of reality. This closer approximation to reality results in heightened levels of satisfaction and enhanced learning outcomes.[11]

Moreover, unfolding case studies enhance the students' self-evaluation ability, engagement in learning, and self-esteem.[12] As students strive to improve, they trial and error different strategies for this purpose. Students facilitated through unfolding case studies performed better than those who received classroom lectures.[13] Noteworthy, educators play the role of facilitator by providing a direction of learning and clarification in the case. Conscientious application of unfolding case studies is imperative for desirable learning outcomes including critical thinking. The deep engagement of students to analyze the multidimensionality to case stimulates their ability to think critically. Critical thinking is core to nursing practice and accentuates educators to use active strategies that could enhance students' critical thinking ability.[14] Unfolding case studies creates a meaningful thinking process in students and they show interest in learning and engage in problem-solving. Research findings have indicated that nursing students exhibit proficiency in problem recognition and solution formulation, a capability attributed to their well-developed analytical thinking skills. Moreover, critical thinking serves as a pivotal conduit for mitigating the schism between theoretical knowledge and practical application in the nursing domain.[15] However, learning outcomes and critical thinking in complex courses is a challenge. A recent systematic review identifies pathophysiology a difficult yet imperative course for bridging clinical reasoning and practice.[16]

Many nursing students consider pathophysiology as a difficult course and it is needed for safe clinical practice being integrated with clinical courses. Additionally, the pathophysiology course is deeply grounded in clinical concepts including cellular changes, fluid, and electrolyte disorders, acid-base imbalance, immunological, gastrointestinal, neurological, musculoskeletal, genitourinary, respiratory, endocrinology, and cardiac disorders. A limited number of researches had been done to measure the effectiveness of unfolding case studies on the nursing students' academic performance and critical thinking. Unfolding case studies have been found to positively impact academic achievement, critical thinking, and self-confidence among undergraduate nursing students[14,17]. While nursing students acquire knowledge, it's crucial for them to develop critical thinking, an

essential skill for clinical practice. The literature underscores the significance of critical thinking in competent nursing practice. Nurses who can think critically are better equipped to make sound decisions for patient care, thereby enhancing the quality of care.[18]

The purpose of this study was to measure the effectiveness of unfolding case studies in students' academic performance and critical thinking disposition in the pathophysiology course.

The following hypothesis were set out in the study;

- Unfolding case studies has no effect on the critical thinking dispositions of the nursing students.
- Unfolding case studies has no effect on the academic performance of the nursing students.

Methods

A pretest posttest within-group quasi-experimental design was used in this study which allowed the implementation of unfolding case studies as an independent variable, academic performance and critical thinking disposition as dependent variables, and demographic including gender, age and type of workplace as co-variables. The study was conducted at a private College in Islamabad, Pakistan from January to December 2020.

The study population was nursing students enrolled in the first semester of Post Registered Bachelor of Science in Nursing (PR-BSN) program at a private college in Islamabad. Pathophysiology is a 2-credit hours course including clinical concepts such as cellular changes, fluid, and electrolyte disorders, acid-base imbalance, immunological, gastrointestinal, neurological, musculoskeletal, genitourinary, respiratory, endocrinology, and cardiac disorders. A census sampling technique was employed to enroll 45 students in the study. The census sampling technique involves the collection of data from every member of the population. The purpose of utilizing census sampling was to expose every participant with unfolding case studies. It provides an accurate complete representation of the population.

The inclusion criteria of this study were all the PR-BSN students who were enrolled in the Pathophysiology course. The exclusion criteria were absence of student in three or more classes and students who were retaking the pathophysiology course.

Critical thinking dispositions were measured with a English-Urdu bilingual Pakistani critical thinking disposition scale[19] reported a favorable 0.86 reliability indices. The scale had been used among nursing students in Islamabad, Pakistan.[15] The scale has 42-items and 7-constructs i.e., contextual perspective, perseverance, reflection, intellectual integrity, creativity, open-mindedness, and, inquisitiveness to measure the critical thinking dispositions of the students. The constructs were rated on a five-point Likert scale (5=strongly agree to 1=strongly disagree), negatively worded items were reverse coded (1=strongly agree to 5=strongly disagree). Academic performance of the students was measured from pretest and posttest of quizzes incorporating multiple choice questions and short answer questions. A total of 11 quizzes were administered relevant to course schedule. Each quiz was consisted of 10 marks. The demographic variables of age, gender, and workplace were included in the data collection tool.

Approval to conduct the study was taken from the institutional review Board (IRB # 318-1138-2020) and the Ethical Committee of the institute. Informed consent forms were provided to the participants along with the data collection tool before the commencement of the study. Data were collected anonymously; none of the students' identifiers was collected.

The critical thinking dispositions scale was administered before the commencement and after completion of the course. The questionnaires were handed over to the students by the program secretary along with informed consent before starting the unfolding case study and were collected on subsequent days. Quizzes including multiple choice questions were administered before the start of each session and were taken at the end of class as well. The quizzes were administered and scored by the examination officer.

Unfolding case study framework and exemplar[20] was used to design the learning experience as followed; Unfolding case studies was applied on the different concepts including cellular changes, fluid, and electrolyte disorders, acid-base imbalance, immunological, gastrointestinal, neurological, musculoskeletal, genitourinary, respiratory, endocrinology and cardiac disorders.

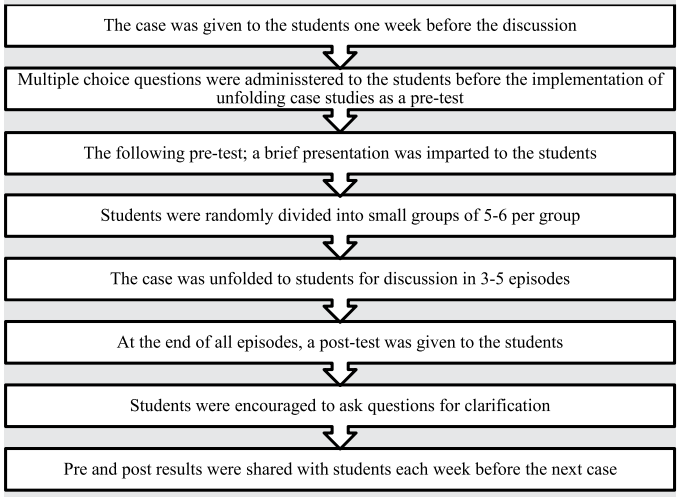

Figure 1: *Flow of the intervention*

Data were coded and entered for analysis in SPSS v 25.0. Frequency and percentage were obtained for demographic variables, mean score and standard deviation of critical thinking dispositions, and pre and post scores of the quizzes of pathophysiology course content. A dependent t-test was applied to measure differences before and after the intervention and P-Value <0.05 was determined as significant. The effect size was calculated by Cohen's d.

Results

The study sample comprised predominantly 80% female students and mostly aged between 31-38 years. Most students 68% were working in the medical and surgical units and the rest 32% in the critical care units. (Table 1)

Table 1: *Demographic characteristic of participants (N= 45)*

Age (Years)	N(%)	Gender	N(%)	Area of Job	N(%)
27-30	14(31%)	Male	9(20%)	Critical care unit	14(32%)
31-34	6(13%)				
35-38	16(35%)				
39-42	4(9%)	Female	36(80%)	Medical surgical unit	31(68%)
43-46	5(12%)				

Comparison of academic performance indicated that the overall mean learning scores are statistically significant P-Value <0.001 higher in the posttest (78 ± 6.7) as compared to pretest (46 ± 10.7). Academic performance scores were higher for cellular changes, fluid and electrolyte disorders, acid-base imbalance, immunological gastrointestinal, neurological, musculoskeletal, genitourinary, respiratory, and endocrine disorders tests P-Value <0.05. There were no statistically significantly different in cardiac disorder test P-Value >0.05, however mean score in the posttest was low 5.29±1.99 than pre scores 7.96±1.81. Overall unfolding case studies produced the large effect size as determined by 3.64 value of Cohen's d. (Table 2)

Table 2: *Comparison of academic performance scores in pretest and posttest(N=45)*

	Topics	Pretest Scoring		Posttest Scoring		T value	DF	P value
		Mean	±SD	Mean	±SD			
1	Cellular Changes	2.67	±2.80	6.27	±1.61	-6.94	44.00	0.001
2	Fluid and electrolytes disorder	2.71	±1.80	5.82	±1.92	-7.33	44.00	0.001
3	Acid base imbalance	3.11	±1.82	6.00	±2.02	-7.05	44.00	0.001
4	Immunological disorder	3.91	±2.23	7.16	±1.55	-8.85	44.00	0.001
5	GI Disorder	3.91	±2.53	7.64	±2.24	-7.09	44.00	0.001
6	Neurological Disorder	5.56	±2.10	7.82	±1.62	-5.53	44.00	0.001
7	Musculoskeletal disorder	4.58	±1.92	7.60	±1.96	-6.62	44.00	0.001
8	Genitourinary disorder	4.27	±2.55	5.91	±2.19	-4.08	44.00	0.001
9	Respiratory disorder	4.31	±2.35	8.49	±1.53	-8.57	44.00	0.001
10	Endocrine disorder	5.78	±3.25	7.33	±2.53	-3.22	44.00	0.002
11	Cardiac disorder	5.29	±1.99	7.96	±1.81	-0.52	44.00	0.607
	Total	46.09	±10.72	78.00	±6.70	-10.38	44.00	0.0001
	***Cohen's d* = 3.64**							

Alpha 0.05, SD: standard deviation, DF: degree of freedom

Table 3: *Comparison of Critical Thinking Disposition in pretest and posttest(N=45)*

	Topics	Pretest score		Posttest score		T value	D.F	P-value
		Mean	SD	Mean	SD			
1	Contextual Perspectives	18.24	1.85	19.58	2.56	-2.86	44.00	0.006
2	Perseverance	25.58	2.17	26.58	3.19	-1.63	44.00	0.110
3	Reflection	24.89	2.51	27.44	3.03	-4.45	44.00	0.001
4	Intellectual Integrity	31.93	2.78	35.27	4.21	-5.35	44.00	0.001
5	Creativity	25.62	2.76	27.96	3.86	-3.81	44.00	0.001
6	Open Mindedness	33.53	2.75	38.62	4.92	-5.93	44.00	0.001
7	Inquisitiveness	33.78	4.37	38.96	3.66	-6.64	44.00	0.001
	Total	193.58	10.43	214.40	18.19	-7.56	44.00	0.001
	***Cohen's d* = 1.40**							

Alpha 0.05, SD: standard deviation, DF: degree of freedom

The overall result indicates that the unfolding case studies have a significant effect on the critical thinking disposition with the p-value is (p-value <.001). The overall mean scores in the posttest were higher (214±18.1) as compared to the pretest (193 ± 10.4). Construct analysis of critical thinking disposition scale shows the significant difference (p-value <.001) in most of the constructs including contextual perspective, reflection, intellectual integrity, creativity, open-mindedness, and inquisitiveness except the perseverance (p= 0.110). Overall unfolding case studies produced a large effect size. (Table 3)

Discussion

Study findings rejected both hypotheses and prove that that unfolding case studies in the pathophysiology course among PR-BSN students significantly improve the academic performance and critical thinking dispositions with large effect sizes of the intervention i.e., unfolding case studies.

Unfolding case studies showed a significant effect on students' academic performance as there was an increase in learning scores with a large effect size. The overall academic performance of students significantly improved in the posttest compared to the pretest, aligning with existing studies.[21,22] These studies present different facets of education and but shared the theoretical natures of their offerings focusing on didactics and strive to improve the knowledge of learners. These findings also illuminate the broader scope for application and effectiveness of unfolding case studies in interprofessional education.[23] The favorable effect of unfolding case studies in the current research demystifies the difficulty of the course contents and also shows the light for safe clinical practices. Studies from adult and acute care settings showed unfolding case study improve the clinical decision making ability and enhance clinical reasoning skills,[16] prioritization skills[14] among students. These findings are further supported by Quality and Safety Education for Nurses (QSEN).[24]

The comparison of academic performance scores in different topics show statistically significantly higher mean scores in the posttest as compared to the pretest except for the cardiac disorders. Firstly, improvement in the score is evident. Secondly, students performed reasonably well in the posttest as well. Unfolding case studies help the students to build on the previous work and connect theory into practice.[16] The educational and practice background of PR-BSN students may have attributed to the performance in the pretest in cardiac disorders. A considerable number of students reported their workplace critical care units in the current research. Perhaps working with cardiac patients helped them to perform better in cardiac disorders. Conversely, few students may have experienced difficulty in constructing the meaning of information and relate to the existing knowledge. Such assertions are consistent with the existing study[25] and further illuminated participants experienced difficulty in understanding the information which leads to difficulty in their application. However, unfolding case studies improved the overall academic performance among most concepts of pathophysiology course. Therefore, this strategy produced a large effect size.

The obtained effect size may be a product of dynamic

mental modeling and self-efficacy stimulated by the process, engagement, and experience of unfolding case studies[26]. The background knowledge and effect of the workplace as the experiential learning is also important. In the unfolding case studies as the case move from the simple to complex in a stage process students have the opportunity to integrate their previous learning with the new one. Regardless of being cooperative, unfolding case studies accentuate individualized learning which stimulates students to be creative in the development of the story as a basis for learning[27].

Unfolding case studies have shown a significant effect on the critical thinking ability of the students in current research. The mean scores in the posttest were significantly higher as compared to the pretest. These results are comparable to the study[14] measuring critical thinking of the students post unfolding case studies including undergraduate nursing students. Regardless of pathophysiology being difficult course[16], the unfolding case study produced a favorable outcome increasing the critical thinking ability of the students. This finding indicates that unfolding case studies could be an effective strategy to enhance critical thinking abilities and didactics of complex and difficult courses. Perhaps, the complexity of information facilitates the development of dynamic mental model associated with the gradual unfolding of the case[26]. Furthermore, unfolding case studies required exposure and reflection on the real-life scenarios that facilitate the students to link the information with their practice environment[28]. Students often encounter complex situations at the workplace requiring problem-solving skills through critical thinking[14,15,29].

There was also a significant difference in most critical thinking dispositions constructs including contextual perspective, reflection, intellectual integrity, creativity, open-mindedness, and inquisitiveness except the perseverance. These findings are consistent with two national studies[15,29]. This study is important empirical evidence, to maintain the stance of genuine curiosity and learning among nursing students. In the present research, unfolding case studies were utilized as a strategy. Academic performance was assessed using a combination of MCQs and SAQs. The incorporation of case scenarios within these questions serves to stimulate critical thinking among students, ultimately fostering a deeper comprehension of the subject matter and broadening the overall scope of their learning. Designing of intervention i.e., development of cases for entire pathophysiology course corroborates reproducible intervention to offer the course using unfolding case studies.

This training may help them to practice unfolding case studies in the future and contribute to the quality of education. The finding of this study could help nursing educators to apply this strategy in their routine practice for the development of knowledgeable and skillful nursing students. Student's hypothesis testing, clinical reasoning, judgment, and problem-solving abilities could improve.

One-group pretest and posttest may be subject to methodological concerns. Therefore, true experimental design comparing traditional with unfolding case studies is recommended.

The study from single private university limits the generalizability. Therefore, findings to other setting may be inferred cautiously. The census sample was also a limitation. A randomized comparative sample could report more confident findings.

Conclusion

Unfolding case studies, in this study, has shown to be an effective teaching strategy to improve the academic scores and critical thinking ability of students in the pathophysiology course. The success of a strategy depends on the careful construction of the case and conscientious application. Therefore, faculty competence to design and implement such strategies matters. More importantly, responsiveness and active involvement of the student is the stepping stone to learn and make most beyond the intended learning outcomes. Students' academic performance in a cooperative and individualized learning environment encourages sharing, builds confidence, and broadens the horizon of learning. It provides a supportive learning environment for students in which students discuss their opinion, search for alternatives, and move to action. Unfolding case studies produce favorable learning outcomes of students. However, the faculty perspective was missing which could be the focus of future research.

Ethical Approval: The Institutional review board approved the study vide letter No. Ref: IRB#318-1138-2020

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Authors' Contribution:
BS: Conceptualized study, drafting of manuscript, data collection and final approval of the draft
GV: Conception of design, data analysis and interpretation, drafting of manuscript and final approval
RBG: Intellectual revisions, drafting of manuscript and final approval of draft

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