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ORIGINAL STUDY

The effect of Critical Concept Map (CCM) in teaching tropical and communicable diseases among undergraduate nursing students

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Abstract

Background: Critical decision-making is the key component of all the nursing courses taught in nursing education. Critical Concept Mapping (CCM) is a teaching method to connect the different concepts, study their relationship, and integrate them in clinical practice. It is used clinically to enhance students' learning in patient status and plan nursing with diagrammatic presentation. The study aimed to analyze the effectiveness of Critical Concept Mapping (CCM) in teaching tropical and communicable diseases among undergraduate nursing students.

Methodology: This quasi-experimental study was conducted on 54 students in four steps. Participants were recruited through simple random sampling from two private nursing colleges, in Karachi, Pakistan. The data was collected through "Scale for the Effectiveness of Concept Maps in Nursing Education' SECMNE" a structured questionnaire developed by Tarım, Boy, and Şanlıtürk in 2022.

Results: The results highlighted that CCM is an effective teaching and learning strategy in tropical and communicable disease courses. Moreover, CCM enhances active learning, develops self-confidence, and improves cognitive abilities for critical thinking. In addition, the study emphasizes that CCM is supposed to be an effective teaching strategy to integrate theoretical knowledge into practical application in class classroom setting.

Conclusion: The study concluded that the Cronbach alpha is excellent therefore, it could be utilized in other studies as well. Moreover, the study concluded that CCM is an effective classroom strategy in the classroom. Therefore, the current study recommends that CCM could be utilized as a classroom strategy where clinics are not part of the course.

Keywords

Critical Concept Map, Classroom teaching method, Clinical and practice integration, Tropical and communicable disease, Nursing students

Introduction

Theorists define critical thinking as an ability to utilize cognitive skills in appropriate decision-making. It requires the ability to analyze, synthesize, self-reflection, and open-mindedness[1]. Nursing is a profession that requires critical thinking skills as in daily work they come across many complex problems related to patients and make decisions regarding patients' need to implement best practices[2].

Experts believe that due to recent advancements in nursing education, many changes in nursing education have occurred. Nursing education is designed in a way that gained theoretical content could be implemented at the clinical site. There is a need to promote critical thinking skills which is one of the important aspects of critical clinical decision making[3, 4]. Researchers define critical thinking as the use of cognitive processes focused on an individual's available data to make clinical judgments and decisions[5, 6].

Educationists believe that traditional teaching approaches are not considerably effective in terms of preparing nurses to think critically in dynamic and flexible clinical settings. Critical thinking skills are the ability to think intellectually and apply higher cognitive skills in analyzing synthesis, and utilization of patient data. Critical thinking skills could be provoked through different teaching strategies such as critical concept mapping. A critical concept map is a teaching method developed in the 1970s by Novak and Gowin to connect different concepts and to study their relationships[7, 8].

A critical concept map has been utilized in medical studies and has proved to be an effective teaching-learning strategy. A critical concept map is a graphical presentation of learned concepts to express their relationship. In a critical concept map, the concepts are placed in different places and connect with the connecting lines labeled as propositions[1]. In nursing education, critical concept mapping is utilized as a method to learn patient conditions and plan nursing care with a diagrammatic representation. This diagrammatic representation provides nursing students the opportunity to learn holistically. In this diagram, the patient disease process, signs and symptoms, laboratory findings, patient's problems, and nursing interventions are present in a systematic way[1, 9].

The connecting lines "propositions" provoke critical thinking skills in nursing students to recognize the actual conditions of patients, and their problems related to the conditions. Furthermore, nursing students can picture patient conditions holistically such as physiologically, pharmacologically, psychologically, and sociologically as well. This holistic presentation of patient conditions helps nursing students to plan nursing interventions by analyzing all the available data[10, 11].

In this way, the nursing student can analyze patient data by encountering the complex picture of the patient and related concepts of the patient diseases and problems. Critical Concept Maps in this way enable students to think critically and make decisions in terms of nursing care in a critical clinical environment through visualizing all aspects of patient conditions[12, 13].

Tropical and Communicable Disease is a course offered in the third-year semester five where student learn about tropical and communicable diseases with their nursing care. To have integrated knowledge of disease process and nursing care critical concept map is one of the teaching methodologies. Through critical concept mapping, nursing students can analyze patient conditions critically and plan nursing care using critical thinking skills. Critical decision-making is a key component of nursing care that needs to be taught in all courses of nursing education. A critical Concept Map is the strategy that could be utilized for the integration of learned concepts of the pathophysiology of diseases and nursing care[14].

The extensive exercise of making concept maps as a classroom activity enhances nursing students' confidence in clinical areas in terms of

critical decision-making independently. Furthermore, it helps to focus on the patient as a whole by critically connecting different aspects of the patient's condition[15, 16].

Therefore, the study aims to analyze the effectiveness of critical concept mapping in teaching tropical and communicable diseases among undergraduate nursing students utilizing the "Scale for the Effectiveness of Concept Maps in Nursing Education' (SECMNE) developed by Tarım, Boy, and Şanlıtürk in 2022.

Methodology

The study conducted was a randomized control trial. Students of BSN year III semester V recruited for the study from Ziauddin University Faculty of Nursing and Midwifery and Baqai College of Nursing. The duration of the study was six months after the approval from the Ethic Review Committee of Ziauddin University (Reference no. 6790323SAEDU). Permission for the collection of data was granted from both nursing colleges, furthermore, written consent was signed by all participants recruited for the study. Before signing the consent, form participants were briefed about the study plan, the process of maintaining confidentiality, and the right to leave the study at any point.

The inclusion criteria were students of BSN year III semester V, who agreed to sign consent and successfully enrolled in the tropical and infectious disease course.

The sample size was calculated using G* Power version 3.1.9.7. The test family applied was t-tests and the statistical test used is Means: Difference between two dependent means. The input parameters were monitored using two-tailed hypotheses at an effect size of 0.5, an alpha error probability of 0.05, and a power (1-Beta Probability) of 0.95. The total sample size calculated was 54. A total of 54 BSN students enrolled from 175 students through a randomized sampling technique using the fishbowl method.

The data was collected through "SECMNE" a structured questionnaire developed by Tarım, Boy, and Şanlıtürk in 2022. The questionnaire has 30 items on a 4-point Likert scale, as "1" never, "2" sometimes, "3" frequently, and "4" always. The lowest score will be 30 from the 30-item final form of the scale was 30, and the highest score will be 120. Items 4, 18, and 22 will be scored inversely. The SECME has three subscales that are 'Integration of a Care Plan subscale (11 items)', 'Integration of Information subscale (16 items)', and 'the Perception subscale (3 items)'.

The scores of the subscales were also calculated separately. The increase in the total score obtained from the scale shows that the concept map is effective in nursing education. The mean score of the SECMNE was 83.13±17.05. The validity of the tool was identified as 0.97 Cronbach alpha. The operational definition of two variables is as follows; CCM (Diagrammatic presentation of concepts and their connections will be made through connecting lines). Nursing students (are BSN III Year semester V students who have attended all classes of Tropical and Communicable Disease course).

The data of the study was collected in four steps. In step 1, all the faculty members involved in teaching the TCD course were briefed about the study and had an introductory session in which primary researchers took the lead in revising the process of formation of CCM and course expectations from the students. In the second step, in the introductory class of TCD students were oriented briefly about the procedure of the study. Students in the intervention group were asked to fill out a self-administered questionnaire adopted from the SECMNE source. This was followed by the intervention phase. Guidelines of CCM and Rubrics were shared and discussed. In Step 3, TCD content was delivered as per schedule. After each unit, students were given a scenario related to the unit and students made a CCM in their assigned groups. Finally, after the course, the SECMNE questionnaire was filled out by the randomly selected students.

The data was analyzed using SPSS version 26. To analyze demographic data frequency and percentages used. To identify the effectiveness of CCM in the TCD course paired t-test was applied. To identify the levels of effectiveness (that were low, moderate, and high level of effectiveness) of CCM in the TCD course Wilcoxon signed ranked test was applied. To identify the association of demographic variables concerning effectiveness levels of concept map in the TCD course Fisher's exact test was applied.

Result

The results of the study show the distribution of demographic variables. Moreover, the study also identifies the overall effectiveness of CCM and the level of effectiveness of CCM before and after applying CCM in the TCD course. Furthermore, the study identifies the Cronbach alpha of the study tool as well which was 0.97.

A total of 54 participants took part in the study among which 31 (57.4%) belonged to the age group ≤21 years and 23 (42.6%) belonged to more than 21 years old. Among all 36(66.7%) subjects were male and only 18(33.3%) were female (Table 1).

It has been noted that after the intervention the scores significantly increased in effectiveness score, integration of care plan, integration of information, and perception (p-values <0.001, 0.03, 0.01, and 0.002) respectively (Table 2).

It has been observed that after intervention level of high effectiveness of the concept map significantly increased from 9(16.7%) to 52(96.3%) (p-value <0.001) (Table 3).

It has been observed that there was no significant association found in the effectiveness level of the concept map concerning demographic variables. The increased level of significance after the application of CCM in the TCD course proved that CCM is an effective classroom strategy for teaching tropical and communicable diseases among undergraduate students (Table 4).

Table 1: The distribution of demographic variables.

n=54	Frequency (%)
Age	
≤21 years	31(57.4)
More than 21 years	23(42.6)
Gender	
Male	36(66.7)
Female	18(33.3)

Table 2: Effectiveness Score of Concept Map in the TCD course.

n=54	Mean±Std		p-value
	Pre	Post	
Effectiveness score	80.85±14.15	103.48±9.36	<0.001
Integration of care plan	36.98±4.63	38.79±3.92	0.03
Integration of information	53.33±6.19	57.40±7.89	0.01
Perception	6.007±2.43	7.648±3.349	0.002

Paired T-test was applied
p-value 0.05 considered significant

Table 3: The level of effectiveness of Concept Map in the TCD course.

n=54	Frequency (%)		p-value
	Pre	Post	
Low effectiveness	23(42.6)	0(0)	<0.001
Moderate effectiveness	22(40.7)	2(3.7)	
High effectiveness	9(16.7)	52(96.3)	

Wilcoxon signed ranked test had been applied
p-value 0.05 considered significant

Table 4: Association of demographic variables concerning the effectiveness levels of concept maps in the TCD course.

n=54	Frequency (%)		p-value
	Moderate effectiveness	High effectiveness	
Age			
≤21 years	2(6.5)	29(93.5)	0.214
more than 21 years	0(0)	23(100)	
Gender			
Male	1(2.8)	37(97.2)	0.61
Female	1(5.6)	17(94.4)	

Fisher's exact test had been applied
p-value 0.05 considered significant

Discussion

The current study validates the "SECMNE" a structured questionnaire developed by Tarım, Boy, and Şanlıtürk in 2022. The study identifies the Cronbach alpha that was 0.97 which is similar to the primary author Cronbach Alpha[7]. The Cronbach alpha is excellent therefore, it could be utilized in other studies as well.

The current study further revealed that the overall effectiveness of CCM in TCD courses is significant. There were three subscales of the questionnaires identifying the integration of care plan, integration of information, and perception of CCM. All subscales' scores were significant in the study. The findings of the study supported by the results of a systematic review highlighted that concept maps not only enhance active learning and develop self-confidence but also improve cognitive abilities for critical thinking[17].
Another study supporting the results of the current study emphasizes that CCM is supposed to be an effective method to enhance critical thinking among nursing students[18]. The current study utilizes the "SECMNE" scale that was used first time in any study. Therefore, the results of subscales could not be compared with any specific studies. However, the results of each subscale could be compared individually.

Researchers claim that concept mapping has been used as part of nursing clinical education for many years but limited studies have been conducted to identify its impact or effectiveness in integrating theory in patient care plan[19]. Another study conducted in Egypt to examine the effects of critical thinking skills utilizing a concept map utilizing a quasi-experimental research method supports the results of the current study. The study endorsed that critical concept mapping is a useful tool for developing critical thinking and inductive reasoning skills for nursing care plans[10]. It is an effective method to integrate all information related to the patient in the pictorial format and to think critically, furthermore, it helps

nursing students to relate patient information with their disease process and plan nursing care accordingly[20].

It was mentioned before that CCM is more often utilized as a clinical learning and evaluation strategy; however, this study tends to utilize CCM as the classroom strategy. The current study concluded that CCM is an effective classroom strategy in teaching tropical and communicable disease courses among undergraduate students. Elasrag & Elsabagh (2020) and Dehghanzadeh & Moadab (2019) study have similar results that the CCM is an effective teaching and strategy to integrate theory into practice, however, no study has been identified in the available literature supporting the finding of the current study[10, 19]. CCM is thought to be a teaching strategy in clinical areas where students utilize and integrate their theoretical knowledge into patient or practice areas[21-23].

The current study recommends that CCM could be utilized as a classroom strategy where clinics are not part of the course. The study recommended that CCM must be included as one of the classroom teaching strategies in every course of the nursing curriculum. There are many rare diseases for which students are unfortunate to care for patients in the clinical area or have less opportunity to take care of such patients. In that case, with different strategies, CCM could be one of the effective tools to learn and integrate patient information to plan nursing care plan in the classroom.

Furthermore, nurse facilitators and educators must be trained in such a way that they can use CCM effectively in integrating their theoretical concepts into clinical practices[23]. Furthermore, there is a need to conduct more studies to identify the effectiveness of CCM as a classroom evaluation strategy in nursing and non-nursing courses. Nowadays nursing education is more focused on providing care utilizing the concept of the patient as a whole. Therefore, the integration of theory and content that student learns in the classroom must be applied in the clinical area in such a way. Implementation of CCM effectively is the responsibility of nurse educators; therefore, they must be trained in a way that they can utilize it effectively for the proper integration of patient information to provide effective care to the patient.

Conclusion

Critical Concept mapping is a teaching strategy that improves students' learning ability to improve critical thinking in the classroom. Students identify their learning needs before patients' care areas which will assist in clinical preparation. This strategy is not only a tool for evaluation but can utilized as a teaching method in the classroom. However, it requires proper training of nurse educators at every level. The study was conducted at only two private nursing colleges therefore, the results of the study could not be generalized. The instrument might have more space for participants to express their experiences. Participants may have been well prepared before the topic.

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