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Effect of Concept Mapping on Critical Thinking of Pediatric Nursing Students Caring for Children with Pneumonia

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Abstract: Background: Concept mapping aims to enhance pediatric nursing students' knowledge and skill acquisition by promoting advanced critical thinking across various scenarios. Purpose of this study was to assess the effect of concept mapping on critical thinking of pediatric nursing students caring for children with pneumonia. A quasi-experimental design (study and control groups) was used. **Setting**: It was conducted in the pediatric nursing department at faculty of nursing at Menoufia University. **Sampling**: A convenient sample 230 third-year undergraduate pediatric nursing students was selected. **Instruments**: Three instruments for data collection were used; instrument one was characteristic of students self-administered questionnaire for pediatric nursing students, instrument two was Watson Glaser Critical Thinking and instrument three was nursing process evaluation structured questionnaire. The results of this study showed that students in the study group showed improvement in mean of critical thinking abilities on posttest 52.73 ± 1.91compared to 18.73± 6.45 on pretest. So there was a highly statistical significant difference between posttest and pretest ($p<.001$). Meanwhile mean of critical thinking of students in the study group was 52.73 ± 1.91 compared to 26.32 ± 17.27 in the control group. So there was a highly statistical significant difference between study and control group on posttest ($p<.001$). **Conclusion**: The study concluded that concept mapping has a positive effect on improving and motivating critical thinking skills among pediatric nursing students. **Recommendations**: this study recommended that nursing students should be encouraged to use concept mapping strategy in nursing education in order to have higher level of critical thinking skills.

Key words: *Concept mapping, Critical thinking, Pediatric nursing students, Pneumonia*

Introduction

Pneumonia is a pulmonary illness caused by an acute respiratory infection, it is the main cause of death among children below the age of 5years, with an overall mortality rate of 18 percent; it is caused by bacteria, viruses, and infection with both types of pathogens at the same time (Abd Elaziz et al., 2024).

Appropriate management requires pediatric nurse's abilities to analyze the relationship between pneumonia and other lung diseases, mechanisms involved in pathogenesis, risk factors and available treatments to provide further insights for future research. One of the most commonly and widely used methods for analyzing the structure of knowledge in various fields such as drugs, medicine, and identification of various aspects of disease is concept mapping (Wang, & Qi, 2022).

Concept mapping is a visual representation of a patient's plan of care. This representation may allow the students to see the patient's health problems and visually connect those problems to the intervention. It can be done in a group or alone. Students can collaborate in small groups to optimize their learning opportunities for one another. It aids students in organizing their thoughts, planning the care of their patients, setting priorities, and thinking critically through helping them to make connections between ideas or concepts they are currently studying (Abo-Elenein et al., 2023).

Critical thinking is meaningful conceptual thinking that includes evidence based analysis, context setting, enthusiastic intellect, purposeful insight and organization. The utilization of fundamental nursing skills necessary for problem-solving, which traditionally focus on helping students analyze, diagnose, intervene, and evaluate the effectiveness of a nursing intervention (Lin et al., 2024).

Traditional method of education teaches the nursing students a certain amount of information, related to many specialties, it does not equip them with the tools that improve students' critical thinking, to be able to analyze, prioritize and organize new information required for effective learning (Pishgooie et al., 2019). Meanwhile, the current nursing education aims, not only to provide an appropriate level of knowledge and skill performance to nursing students, but also is expected to improve problem solving, decision making and critical thinking abilities indifferent circumstances (Abd El-hay et al., 2018).

Effective nursing intervention is required to sustain safe nursing practice and high-quality of care for children with pneumonia. Above all todays healthcare system is complicated because of the challenging task for educators to produce nurses who possess the abilities to perform problem-solving, decision making, clinical reasoning, advance nurse-patient communication and apply theory in clinical practice. However, concept mapping is supposed to enhance critical thinking and reasoning process of pediatric nursing students by fostering

discovery, the acquisition of clinical knowledge, and meaningful learning (Latif et al., 2022)

Significance of the study

Nursing education encounter many worldwide challenges and continuously attempt to improve teaching and learning strategies in theory and practice. Due to the rapid changes of science, meaningful learning are becoming more important for nursing students who need to keep abreast of these changes that relate to the practice of pediatric nursing. To remain professionally, competent, pediatric nursing students who are the future pediatric nurses needs to be critical thinkers, problem solvers and lifelong meaningful learners .Pneumonia are the most common pediatric health disorders in Egypt. Use of concept mapping activities may improve students' critical thinking and enhance their provision of care for children with pneumonia (Barta et al., 2022). For this reason, this study will be done to assess effect of concept mapping on critical thinking of pediatric nursing students caring for children with pneumonia

Definition of variables

Concept mapping is a technique that uses a graphic depiction of nonlinear and linear relationships to represent critical thinking. Concept maps are context dependent and can be used to develop analytical skills by linking the attributes of the concepts to make a meaning of the concept (Bilik et al., 2020). In this study, students will draw a map of the contents of caring of children with pneumonia to make analysis, evaluation, and reasoning. Then, they will be able to summarize the content while preserving the meaning.

Critical thinking: is the process of intentional higher level thinking to define a client's problem, examine the evidence-based practice in caring for the client, and make choices in the delivery of care (Omaswick et al., 2018). In this study, the process of critical thinking requires the pediatric nursing student to think creatively, use reflection, engage in analytical thinking, make nursing care plans, inference, assumption, deduction, interpretation and evaluation. It will be assessed using Watson Glaser Thinking Appraisal (Instrument two) and nursing process evaluation (Instrument three)

PURPOSE OF THE STUDY

To assess the effect of concept mapping on critical thinking of pediatric nursing students caring for children with pneumonia

RESEARCH HYPOTHESES

- Students who use concept mapping will have higher critical thinking skills on posttest than pretest
- Students who use concept mapping will have higher critical thinking skills (study group) than students who use traditional methods of learning (control group)

METHODS

Research Design:

A quasi-experimental design (study and control groups) was utilized in conducting this study.

Research setting:

This study was conducted in the pediatric nursing department and pediatric unite at Menoufia University hospital. The unit contains 3 words for pediatrics. One word for pneumonia and last discussion conducted in medical lab in the pediatric department in the faculty of nursing. It contains 3 labs for teaching.

Sampling:

A convenient sample of 230 Pediatric Nursing Students who are enrolled in the Faculty of Nursing, Menoufia University was selected.
Based on this formula:

$$\text{Unlimited population: } n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

Where

z is the z score

ε is the margin of error

n is sample size

p̂ is the population proportion (P= 573 Pediatric Nursing Students)

z for a 95% confidence level is 1.96. **p̂** for the population proportion is 0.050. **ε** for the margin of error is 0.05.

$$\text{n} = \frac{1.96^2 x 0.050(1-0.050)}{0.05^2} = 230\ Students$$

Thus, a sample size of 230 students would be necessary for conducting the study. Students were randomly divided into two groups, one control group 115students divided into three groups, two groups contained forty-eight students (each), one group included nineteen students and one study group 115 students divided into three groups, two groups contained forty-eight students (each), one group included nineteen students.

Data collection instruments

In order to achieve the purpose of the study, the following instruments were used:

Instrument one: A Self-administered Questionnaire:

The researchers constructed a questionnaire sheet after reviewing the related literature. It was used to assess the personal characteristics of students as age, gender, and residence.

Instrument two: Watson Glaser Critical Thinking Appraisal (WGCTA):

It was developed by Watson-Glaser (1980) and modified by the researcher to be applicable for nursing students and assess their analytical reasoning as well as logic. It contained 40 items located in 5 subscales inference included 5 items, recognition of assumption contained 12 items, deduction included 5 items, interpretation contained 6 items, evaluation of Arguments was made of 12 items. The items were in the form multiple-choice format.

- **Part one: Inferences subscale**

This test included four situations used to assess the ability of students to discriminate and choose between alternatives related to the formulated statements
Every situation contained four statements related to pneumonia clinical nursing intervention. Each statement had four alternatives for

answering as follows: T: True, PT: Probably True, ID: Insufficient Data, F: False

Each statement was scored as: Correct answer =1, incorrect answer =0

Scoring system for each item:-

Items	Score
Low inferences	(0- < 10)
High inferences	(10- 20)

Total score (0-20)

- **Part two: Recognition of Assumption subscale**

This test contained twelve questions to measure the ability of students to recognize the quality of assumptions in relation to given information in the statements. Every question contained four statements related to pneumonia clinical nursing intervention developed by the researcher, the permitted alternatives for answers were:
(SM: Assumption Was Made), (SNM: Assumption Was Not Made)
Each statement was scored as: Correct answer =1, incorrect answer =0

Scoring system for each item:-

Items	Score
Poor assumption	(0- < 6)
Good assumption	(6- 12)

Total score (0-12)

- **Part three: Deduction subscale**

This test included five questions to measure the ability of students to decide if given specific conclusions are derived from various general statements. Every question contained four statements related to pneumonia clinical nursing intervention developed by the researcher. There were two alternatives for answering for each statement, (CF: Conclusion Follows), (CDF: Conclusion Does Not Follow). Each statement was scored as: Correct Answer =1, incorrect Answer =0

Scoring system for each item:-

Items	Score
Poor deduction	(0- < 3)
Good deduction	(3- 5)

Total score (0-5)

- **Part four: Interpretation subscale**

This test contained six questions to measure the ability to decide if conclusions were drawn validly from given data. Every question contained four developed statements related to pneumonia clinical nursing intervention. (CF: Conclusion Follows), (CDF: Conclusion Does Not Follow). These conclusions were the two alternatives to answer each statement. Each statement was scored as: Correct Answer =1, incorrect Answer =0

Scoring system for each item:-

Items	Score
Poor interpretation	(0 - < 3)
Good interpretation	(3- 6)

Total score (0-6)

- **Part five: Evaluation of arguments subscale**

This test included twelve questions to measure the ability to distinguish between argument strong and argument weak. Each question contained four statements related to pneumonia clinical nursing intervention developed by the researcher. The two permitted alternatives for answering of each statement were: (AS: argument Strong)

and AW: Argument Weak. Each statement was scored as: Correct Answer =1, Incorrect Answer=0

Scoring system for each item:-

Items	Score
Poor evaluation of arguments	(0- < 6)
Good evaluation of arguments	(6-12)

Total score (0-12)

Reliability

The reliability of the instrument was estimated to determine the extent to which items in the instrument were related to each other by Cronbach's co-efficiency Alpha (a= 0.90). So it can be concluded that the instrument had a high level of reliability.

Instrument three: Nursing process evaluation structured questionnaire

It was developed by the researcher after a review of related Literature (Sekhon et al., 2022). It contained evaluation of students' abilities to analyze of data related to care of children with pneumonia. It included the following parts:-

- **Part one: Nursing process checklist**

It included assessment, diagnosis, planning, implementation and evaluation reviews. Assessment contained 2 evaluative statements, diagnosis contained 7 evaluative statements, planning contained 5 evaluative statements, implementation contained 6 evaluative statements, and evaluation contained 2 evaluative statements.

Scoring system for each item:-

Items	Score
Not done	0
Incomplete	1
Complete	2

Total score (0-44)

- **Part two: Physical examination Checklist**

It contained 9 items such as Skin, Head, Eye, Ear, Mouth, Nose, Chest, Cardiovascular and Abdomen. Skin contained 7 items; Head contained 5 items, Eye contained 5 items, Ear contained 4 items, Mouth contained 5 items, Nose contained 4 items, Chest contained 7 items, cardiovascular contained 4 items and Abdomen contained 3 items.

Scoring system for each item:-

Items	Score
Not done	0
Incomplete	1
Complete	2

Total score (0-88)

- **Part three: Health History Checklist**

It contained 7 items such as Biographical information (Age, Sex, and Marital status), Chief compliant or reason for visit, History of current illness and past health status of children diagnosed with pneumonia.

Scoring system for each item:-

Items	Score
Not done	0
Incomplete	1
Complete	2

Total score (0-14)

Reliability

The reliability of the instrument was estimated to determine the extent to which items in the instrument were related to each other by Cronbach's co-efficiency Alpha (a= 0.83). So it can be concluded that the instrument had a high level of reliability.

Validity

For validity assurance purposes, the instruments were submitted to a jury of five experts in the field (three Professors in pediatric nursing, one professor in Pediatric medicine and one professor of education).

Pilot study

It was carried out on a sample of 10 nursing students after the instruments were developed and before starting the data collection to test the practicability, applicability and to estimate the needed time to fill the instruments. No necessary modifications were done.

Ethical considerations:

A written approval was obtained from Ethical and Research Committee of the Faculty of Nursing, Menoufia University. Written consent was obtained from all participating students after explaining purpose of the study, benefits, and risks. Students who agreed to participate in the study were informed that participation in the study was voluntary and they could withdraw from the study at any time without penalty. Confidentiality and anonymity of Students were assured through coding all data and putting all papers in a closed cabinet

Procedure:

- An official permission to conduct the study was obtained from Head of Pediatric Nursing Department, Faculty of Nursing, Menoufia University after submission an official letter from supervisor contained the purpose and methods of data collection.
- Assessment was carried out for all 3rd year nursing students enrolled in pediatric nursing department during the second semester of academic years 2022/2023 using instrument two and three.
- The researcher clarified for the students the purpose of each test, its content and how to answer it. Then, a simple random sample was used to assign students into study and control groups. Preparation at pediatric medical area by selecting the medical conditions to be discussed in the pre-conferences and post-conferences.
- Students in the control group received only traditional teaching session to conduct nursing care plans.
- Students in the study group received workshops about concept mapping. It included concept mapping meaning, importance, steps, types, application and evaluation, advantages and disadvantages, application and integration between critical thinking, concept mapping and nursing process to formulate nursing care plan.
- Each student in the study group received three sessions in the form of pre conferences along three consecutive days to be allowed to

study patients. Accordingly handouts and teaching materials were planned.

- In the first session, the researcher presented the purpose of the study, definition and importance of concept mapping, steps of constructing concept mapping, four types of concept mapping ,organization of a concept map according to the elements of the nursing process and advantages and disadvantages of applying concept mapping,. Handouts were provided to the students during pre-conferences.
- The second session was conducted to revise the elements of nursing process and its application using the concept mapping. It started with assessment phase (data collection, its source, validation and interpretation of data).
- The third session included reading assignments about pneumonia to help students to complete the map including the expected complications, pathophysiology and nursing intervention of each problem
- During the post-conferences, the researcher selected an actual patient situation and applied the concept mapping by extracting the key concepts of the situation, interrelating the different diagnosis related to the situation and delineating problems, investigations, medications and expected complications based on pathophysiology of each diagnosis presented on the situation using teaching medias such as posters or flip charts
- Each concept map developed by students, was discussed and comments were provided. Every student was instructed to revise the map if the information was incomplete.
- Final evaluation for critical thinking abilities was done immediately after finishing the medical area in the pediatrics unit for the two groups(study and control groups) using instruments two and three

STATISTICAL ANALYSIS

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. Graphics were done using Excel program. Quantitative data were presented by mean (χ) and standard deviation (SD). It was analyzed using student t test for comparison between two means. Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square ($\chi 2$) test. No statistical significance was considered if P-value > 0.05. A statistical significance was considered if P-value < 0.05. A highly statistical significance was considered if P-value < 0.001. A very highly statistical significance was considered if P-value<0.0001.

RESULTS

Table 1 shows characteristics of studied students in the study and control groups. It was obvious that about half (49.6%) of studied students in the study and control groups were 21 years old. Regarding sex, more than half (59.1%) of studied students in the study group and more than three quarters (76.5%) in the control group were females. Therefore, there was

statistically significant difference in relation to sex between the study and control groups

Table 2 demonstrates means and standard deviations of appraising studied students' critical thinking abilities regarding pneumonia in the study and control groups on pre and posttest. There were a statistical significant improvement regarding students' critical thinking abilities (interpretation, inferences, recognition of assumption, deduction, evaluation of arguments) related to pneumonia in the study group on posttest compared to pretest (e.g. Interpretation 5.68 ± .61 VS 2.10 ± 1.34). So there were a highly statistical significant difference between pre and posttest (p<.001). Also in the control group, there were an improvement on posttest compared to pretest (e.gInterpretation2.75 ± 2.62 VS 1.74 ± 2.34) .So there were a statistical significant difference between pre and posttest. Also on posttest there were a statistical significant improvement regarding students' critical thinking abilities related to pneumonia in the study group compared to students in the control group (e.g. Inference 19.24 ± .1.15 VS 9.07 ± 4.33).So there was a highly statistical significant difference between study and control group on posttest (p<.001).

Table 3 reflects mean for appraising studied students' critical thinking abilities in the study and control groups on pre and posttest. In the study group, mean for critical thinking abilities was 52.73 ± 1.91on posttest compared to 18.73± 6.45 on pretest. Also on posttest mean of critical thinking of students in the study group was 52.73 ± 1.91 compared to 26.32 ± 17.27 in the control group. So there was a highly statistical significant difference between study and control group on posttest (p<.001).

Table 4 shows mean and standard deviation of students' level of developing and implements the nursing process in the study and control groups on pre and posttest. The findings revealed that there were a statistical significant improvement in student's nursing process implementation in the study group on posttest compared to pretest (e.g. complete history taking 12.19 ± 3.54 vs. 7.96 ± 2.18). So there were a highly statistical significant difference between pre and posttest (p<.001). Also in the control group, there were an improvement on posttest compared to pretest (e.g. complete history taking 11.13 ± 2.40 vs. 8.20 ± 2.21). So there were a statistical significant difference between pre and posttest. Also on posttest there were a statistical significant improvement in student's nursing process implementation in the study group compare to students in the control group. So there were a highly statistical significant difference between study and control group on posttest (p<.001).

Table 5 displays mean scores for evaluation of the nursing process implementation by students in the study and control groups on pre and posttests. In the study group, total mean for evaluation of the nursing process was 70.13 ± 7.11 on posttest compared to 34.87 ± 5.64 on pretest. Also mean scores for evaluation of the

nursing process in the study group was 70.13 ± 7.11 compared to mean scores for evaluation of the nursing process in the control group was 48.49 ± 9.17on posttest. So there was a highly statistical significant difference between study and control group on posttest (p<.001).

Table 6 illustrates correlation between students' levels of critical thinking appraisal, nursing process evaluation and history taking in the study and control groups. There was a significant correlation between levels of critical thinking and nursing process evaluation and history taking of students in the study group. So there was a highly statistical significant difference between levels of critical thinking and nursing process evaluation and history taking. Meanwhile there was no correlation between levels of critical thinking and nursing process evaluation and history taking of students in the control group. So there was no correlation between levels of critical thinking and nursing process evaluation and history taking.

Figure 1 shows levels of appraising studied students' critical thinking abilities regarding pneumonia in the study and control groups on pre and post test. On posttest there were a statistical significant improvement regarding levels of appraising studied students' critical thinking abilities related to pneumonia in the study group compared to students in the control group. So there was a highly statistical significant difference between study and control group on posttest.

Table (1): - Characteristics of studied students in the study and control groups.

Sociodemographic characteristics	Study group (n=115)		Control group (n=115)		χ^2	P- value
	No.	%	No.	%		
Age						
20 years	26	22.6%	32	27.8%	1.40 ns	.704
21 years	57	49.6%	57	49.6%		
22 years	30	26.1%	25	21.7%		
23 years	2	1.7%	1	0.9%		
Sex						
Male	47	40.9%	27	23.5%	7.97 S	.005
Female	68	59.1%	88	76.5%		

Note: S: Significant (p<0.05) ns: not significant (p>0.05)

Table (2): Means and standard deviations of appraising studied students' critical thinking abilities regarding pneumonia in the study and control groups on pre and post test

Critical thinking appraisal (Mean ± SD)	Study group	Control group	Independent t test	p-value
Interpretation				
Pre intervention	2.10 ± 1.34	1.74 ± 2.34	2.376 S	.018
post intervention	5.68 ± .61	2.75 ± 2.62	17.690 HS	.000
Paired t test	-11.675 HS	-3.077 S		
p-value	.000	.002		
Inferences				
Pre intervention	6.28 ± 3.16	5.92 ± 2.89	5.577 HS	.000
post intervention	19.24 ± 1.15	9.07 ± 4.33	20.715 HS	.000
t test	-24.325 HS	-6.501 HS		
p-value	.000	.000		
Recognition of assumption				
Pre intervention	5.07 ± 1.85	4.43 ± 5.17	2.482 S	.014
post intervention	11.46 ± .77	6.38 ± 5.32	15.069 HS	.000
Paired t test	-10.143 HS	-2.814 S		
p-value	.000	.005		
Deduction				
Pre intervention	1.51 ± .94	1.58 ± 1.86	-4.308 HS	.000
post intervention	4.74 ± .47	2.42 ± 2.06	18.571 HS	.000
Paired t test	-11.751 HS	-3.252 S		
p-value	.000	.001		
Evaluation of arguments				
Pre intervention	3.75 ± 1.89	3.73 ± 4.83	3.687 HS	.000
post intervention	11.58 ± .68	5.67 ± 5.25	20.148 HS	.000
Paired t test	-11.941 HS	-2.911 S		
p-value	.000	.004		

Note: (HS): High significance (p<.001) S: Significant (p<0.05)

Table (3): Mean of appraising studied students' critical thinking abilities in the study and control groups on pre and posttest.

Critical thinking appraisal (Mean ± SD)	Study group	Control group	Independent t test	p-value
Pre intervention	18.73± 6.45	17.42 ± 13.24	4.409 HS	.000
post intervention	52.73 ± 1.91	26.32 ± 17.27	19.159 HS	.000
Paired t test	-16.290 HS	- 4.382 HS		
p-value	.000	.000		

Note: (HS): High significance (p<.001)

Table (4): Means and standard deviations of students' level of developing and implement the nursing process in the study and control groups on pre and posttest.

Variables (Mean ± SD)	Study group	Control group	Independent t test	P-value
History taking				
Pre intervention	7.96 ± 2.18	8.20 ± 2.21	-.809 ns	.419
Post intervention	12.19 ± 3.54	11.13 ± 2.40	2.632 S	.009
Paired t test	-11.035	-9.626 HS		
P-value	.000 HS	.000		
Physical examination				
Pre intervention	8.44 ± 2.51	8.65 ± 3.36	-.533 ns	.595
Post intervention	14.31 ± 3.75	12.62 ± 2.19	4.162 HS	.000
Paired t test	-2.870 HS	-10.610 HS		
P-value	.000	.000		
Assessment				
Pre intervention	2.00 ± .00	2.00 ± .00	No statistics can be computed	
Post intervention	4.01 ± .18	2.62 ± .93	21.740 HS	.000
Paired t test	-14.645 HS	-7.208 HS		
P-value	.000	.000		
Diagnosis				
Pre intervention	7.8 ± 1.11	7.69± 1.18	.975 ns	.331
Post intervention	13.96 ± .26	9.00 ± 2.43	18.313 HS	.000
Paired t test	-12.462 HS	-5.164 HS		
P-value	.000	.000		
Planning				
Pre intervention	2.28 ± 2.33	2.19 ± 2.30	.313 ns	.755
Post intervention	10.00 ± .00	3.92 ± 3.55	21.082 HS	.000
Paired t test	-11.706 HS	-4.378 HS		
P-value	.000	.000		
Implementation				
Pre intervention	5.40 ± 1.41	5.52 ± 1.65	-.600 ns	.549
Post intervention	12.00 ± .00	7.55 ± 2.26	13.240 HS	.000
Paired t test	-16.098 HS	-7.787 ns		
P-value	.000	.000		
Evaluation				
Pre intervention	.93 ± .89	.96 ± .97	-.212 ns	.832
Post intervention	3.65 ± 52.50	1.62 ± 1.45	7.541 HS	.000
Paired test	-10.952 HS	-4.052 HS		
P-value	.000	.000		

Note: (HS): High significance (p<.001) S: Significant (p<0.05) ns: not significant (p>0.05)

Table (5): Mean scores for evaluation of the nursing process implementation by students in the study and control groups on pre and posttests.

Evaluation of the nursing process (Mean ± SD)	Study group	Control group	Independent t test	P-value
Pre intervention	34.87 ± 5.64	35.22 ± 6.21	-.444 ns	.657
post intervention	70.13 ± 7.11	48.49 ± 9.17	19.998 HS	.000
Paired t test	-24.823 HS	-11.682 HS		
P-value	.000	.000		

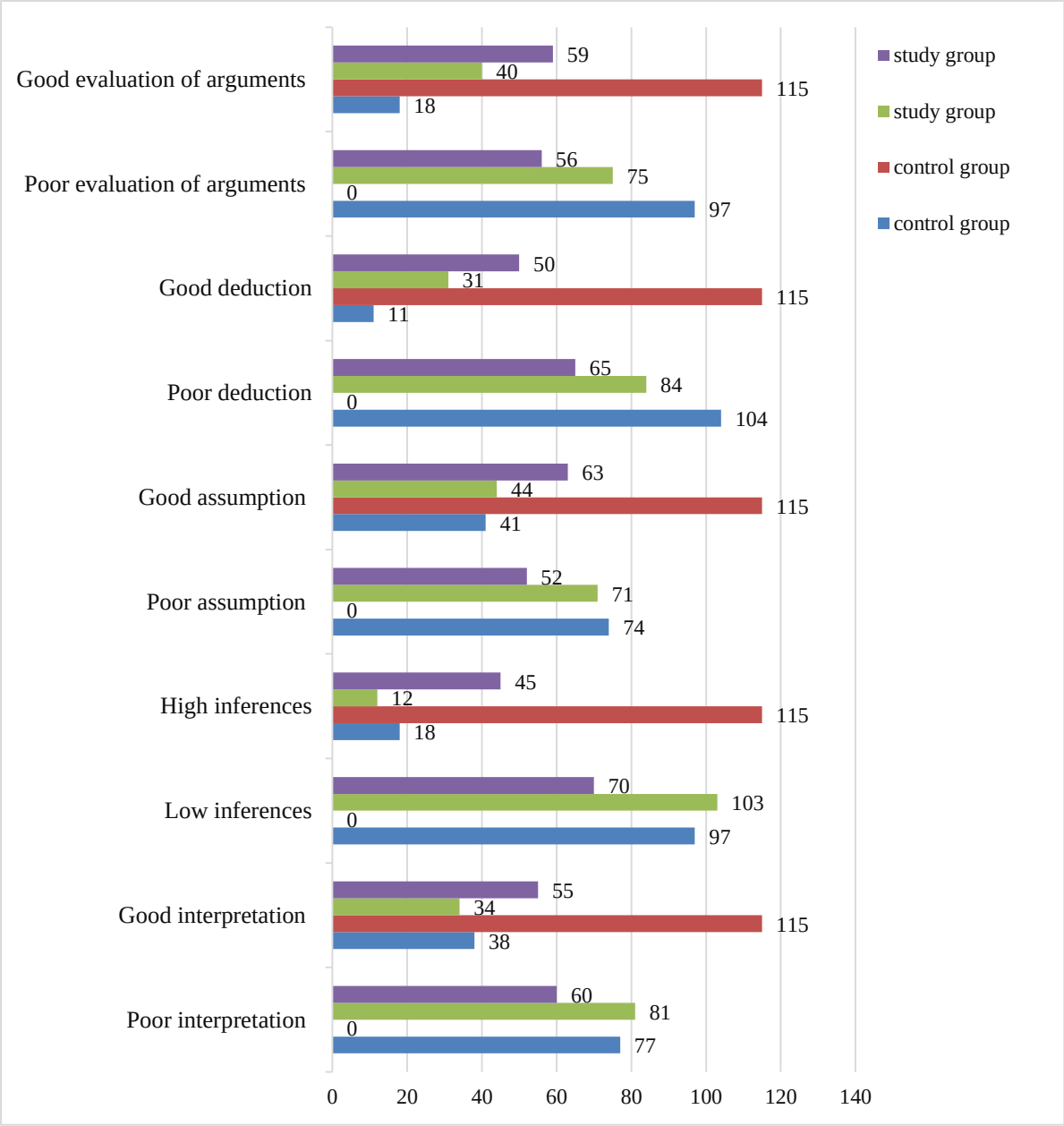
Note: (HS): High significance (p<.001) ns: not significant (p>0.05)

Table (6): Correlation between students' levels of critical thinking appraisal, nursing process evaluation and history taking in the study and control groups.

	Total critical thinking appraisal			
	Study group		Control group	
	R	P- value	r	P- value
Nursing process evaluation	.847**	.000	.126 ns	.180
History taking	.627**	.000	-.113 ns	.231

** Correlation is significant at the 0.01 level (2- tailed). Note :(NS): Not significant (p>0.05)

Figure (1): levels of appraising studied students' critical thinking abilities regarding pneumonia in the study and control groups on pre and post test



Discussion

Due to complex healthcare environments and the quick advancement of social, technological, and medical elements of patient care, nurses nowadays face several difficulties. The strain on nursing educators play an important role in selecting the most effective teaching strategy that can equip student nurses to work in a variety of healthcare settings, think critically to solve patients' problems, and deliver safe patient care is increased by all these challenges. The teaching and learning techniques that enhance critical thinking abilities and knowledge acquisition should be considered by nursing educators Alsaleh et al., (2020). In this direction, the purpose of this study was to evaluate the effect of using concept mapping on critical thinking of pediatric nursing students caring for children with pneumonia.

The current study hypothesized that students who used concept mapping would have higher critical thinking skills on posttest than pretest (first hypothesis). In relation to students' interpretation, the findings of the present study showed that there was a statistical significant improvement in students' interpretation skills related to pneumonia in the study and control groups on posttest. Above all, on posttest students in the study group had better interpretation skills than students in the control group. This could be due to the linear format of the nursing care plan is based upon the nursing process that does not always allow for a holistic picture of patient needs and does not allow for visualization of the interrelatedness of patient data. In contrast, concept maps provide a format to visualize physiological, pathophysiological and psychological relationships and interactions in a concrete fashion, which is more effective to support quality analysis.

This result was consistent with Bilik et al., (2020) who reported that the use of concept mapping provides an opportunity for educators to assist the students in interpreting and seeing the entire perspective. It helps students realize not all patients with the same illness respond similarly. This finding was in line with Bizimana et al., (2024) who reported that there was a maximal variation between the study and control groups in relation to the scores of all areas of critical thinking skills and also in their scores of students' interpretation skills in applying the nursing process before conduction concept mapping. This could be due to students didn't learn to analyze, interpret and conclude according to the information available. Those students were only capable to recall the information to answer the direct questions. In this respect, Barta et al., (2022) emphasized that critical thinking in nursing involves knowledge as well as the process of transferring and applying information to new situations.

This finding was consistent with Ashipala et al., (2023) who emphasized that the **technique** of concept mapping as a hierarchical graphic organizer helps the students to visualize and discriminate between

true and false inference drawn from given data and increases their ability to pay attention, to copy accurately, to follow an argument, to detect ambiguity and to test guesses.

These results were in harmony with Zandvakili et al., (2019) who reported that the use of concept mapping improved the students' abilities to recognize stated and unstated assumptions through being more able to search, make hypothesis, organize the patients' data, categorize, make relationships and finally formulate nursing diagnosis.

In the same context,, Lin et al., (2024) who reported that the students modified their way of thinking and learning style by using a concept map teaching-learning strategy and simulated cases, also their learning style have been changed from reliance on rote learning to image memory, and their thinking process from linear (cause-effect) to multifaceted thinking at different levels.

This result was consistent with Idris, (2024) who noted that concept mapping helps students to engage in the following crucial process: organizing, categorizing, analyzing, evaluating and critical reasoning which in turn enables them to distinguish between strong relevant or weak irrelevant arguments

In relation to hypothesis two: Students who used concept mapping would have higher critical thinking skills (study group) than students who used traditional methods of learning (control group); the findings of current study clarified that there was a statistical significant improvement in student's level of practice regarding patient's examination in the study group on posttest compared to students in the control group. So there was a statistical significant difference between students on study and control group on posttest. From the researcher's perspective view this improvement of students' performance could be due to using concept mapping that developed their clinical practice and lead to excellent patient care outcome.

This result was consistent with Pishgooie et al., (2019) who reported that students in the concept map group compared to the traditional one (lecture) group had a better performance in the practice domain. Also, there was a significant difference between the groups regarding knowledge. This could be attributed to the effect of concept mapping on encouraging the students to search about the data which lead to appropriate clinical judgment and excellent patient care outcome.

Also, the study findings came in agreement with Barta et al., (2022) **who** reported that the concept mapping method had a significant effect on the improvement of students' analyticity, as a cognitive disposition, and for all motivational critical thinking dispositions (open mindedness, truth-seeking, inquisitiveness), compared with the traditional method. This could be due to utilization of concept mapping helped students to understand is much more comprehensively than students who use to the traditional learning method. Also, it saves the time of students that allows them to

collect more of the patients' data. Furthermore, it saves nurse educators time which allows them to monitor students' progress easily.

Conclusion

Based on the findings of the present study, the following is concluded: nThis study concluded that concept mapping has a positive effect on improving critical thinking of pediatric nursing students caring for children with pneumonia. Students who used concept mapping have higher critical thinking skills level on posttest than pretest. Furthermore, Students who used concept mapping had higher critical thinking skills level than students who used traditional methods of learning.

Recommendation

Based on the results of the study it was recommended that: Concept mapping should be integrated into pediatric nursing education. Evaluations of nursing practice should be done properly through assessing nursing abilities for making Interpretation, inferences, recognition of assumption, deduction and evaluation of arguments. Nurse educators should develop clinical simulations to encourage the students to make relationships between the key concepts related to different clinical situations and reach to appropriate clinical judgment in the nursing care plan. Further studies are needed to compare the impact of concept mapping and other metacognition strategies on various learner types.

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