

## Applying Concept Mapping on Postgraduate Nursing Students' Critical Thinking for Practicing Nursing Process

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**Abstract:** Concept mapping is one of the active teaching and learning methods promoting critical thinking. Appropriate nursing care, problem solving and effective critical thinking are necessary for all nurses in order to make complex decisions that improve patient outcomes, safety, and quality of nursing care plan. **The aim of the study :** To evaluate the application of concept mapping on postgraduate nursing students' critical thinking for practicing nursing process.

**The sample** consisted of all post graduate nursing students (35) who evaluated in the skill lab and clinical setting during their preparatory course.

**Three tools** were used to collect the required data as follow:

**Tool (I):** "A Structure Interview Questionnaire for post graduate nursing students". It comprises of two parts: Part one: personal data of post graduate nursing students, which includes: age, sex, experience, work place. Part two: post graduate nursing students' knowledge assessment sheet, it was developed by the researchers to assess the students' knowledge about concept mapping and critical thinking.

**Tool II:** California Critical Thinking Disposition Inventory (CCTDI): it was used to measure critical thinking skills of post graduates nursing students.

**Tool (III):** " Case study rubric for assessing nursing process, It was used to evaluate the application of postgraduates nursing students' nursing process .

**The results** revealed that majority of the postgraduate nursing students had low total knowledge level regarding critical thinking and concept mapping pre intervention; while post intervention values were improved.

**Conclusion:** The study revealed that concept map is an effective learning tool in nursing education, where recoded improving of post graduate nursing students' critical thinking, nursing process subscales and concept mapping knowledge post intervention.

**Recommendations:** Concept maps should be included in nursing curricula of an evidence-based nursing education strategy.

**Key wards:** Concept mapping, Critical thinking, Nursing process, Postgraduate nursing students.

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### I. Introduction

Today's healthcare environment is complicated and highly sophisticated as a result of advancement in technology and increasing in the level of patient acuity. So nurses should have to think critically and solve problems they face in clinical practice settings efficiently. Prepare nurses to think critically is a great challenge for nurse educators to help the graduate nursing students possess the required skills to be competent in performing their job duties to improve nursing process (Amouzeshi et al 2015 and Obied & Abo Gad 2017).

Critical thinking CT is considered a bridge connecting between nurses' knowledge's and their actions. Over thirty years there has been no clear and widely accepted definition and evaluation of critical thinking in nursing. Clinical simulation literature focuses on critical thinking development and it equated with the classic executive cognitive function, which include: problem solving, information processing, planning ahead working memory and attention. Critical thinking CT has both affective and cognitive components. The affective components include confidence, contextual perspective and reflection, while the cognitive involve analyzing, applying standards, and transforming of knowledge (Scheffer and Rubinfeld (2010). Lacking in CT skills lead to poor communication and decision making (Facione and Facione (2013).

Concept mapping is an innovative approach in health care education. It considers one of the active teaching and learning methods promoting critical thinking. The students are better able to organize knowledge, create Connections, and develop clinical judgment skills that ultimately improve patient safety and quality care. Concept mapping represents subject by knowledge's using diagrammatic relationships among concepts, it have

unique characteristics that make it differ from other tools used for knowledge representation involve: propositional structure that means the maps express the most relevant relationships between a set of concepts. Hierarchical structure, represented in a graphically hierarchical fashion, which tends to be read from the top (Schön 2017).

Concepts maps help postgraduate nursing students to learn by making new links between the new ideas, the previous ideas and experiences. So critical thinking and reflective thinking can be easily applied. Concept maps can be implemented in the learning setting by both educator and students through two ways, it generated by the educator usually, depend on the course material used by the university. These maps consider as key information for the main topics to be implemented and link each lesson plan together (Ignatavicius D. 2019, **Yıldırım2011**).

Postgraduate nursing education focuses on enhancing nurses' competencies problem solving and decision making skills to ensure their competence in dealing with the different problem they face in their clinical practice. Concept mapping enable post graduate nurses to think about the problems from a holistic view, to develop a comprehensive plan to solve problems, through assessing what they know about the present situation as well as determining what other required information. (Ignatavicius D. 2019).

Postgraduate nurses have to develop and write nursing care plans to provide and organize nursing interventions based on identified patients' needs. In addition they need to be able to quickly conceptualize the plan of care in a functional format as they graduate and enter the practice arena, where they will be expected to care for multiple patients simultaneously and to rapidly use the nursing process to develop a nursing plan of care based upon priority needs of these patients. Concept map development is an alternative to using care plans as a method to document a plan of care based on evidenced-based practices(Eddie 2016).

The nursing process considers one of the modified scientific method of continuous and cyclic process that can be ended at any time when the problem solved. The nursing process has a wide scope as it deals with individual/family/community problems and physical, social and emotional needs. Currently most State Nurse Practice Acts include the term boards of nursing (NCSBN) 2016, define nursing process as "A scientific clinical reasoning approach to client care which, includes assessment, analysis, planning, implementation and evaluation". Although nursing process can be used with beginning students as a foundation tool, different types of thinking that are less linear and prescriptive are needed to ensure safe, high-quality care. So critical thinking is a vital factor to be combined in every step of nursing process (Eddie 2016).

The maps help in the chance of change in the health strategy and thinking process. So, in order to make well prepare student the healthcare educators ,apply map teaching as it has a good effect on student critical thinking experience. The concept map strategy helps students in establishing client's systemically diagnose the problem, symptoms, treatments, and interventions (**Hultquist, 2016, and Nirmala & Shakuntala 2011**). The nursing students collect data in the form of objective data or subjective data and apply nursing process framework which involve nursing diagnoses. The nurse prioritizes the multiple nursing diagnoses. A measurable goal/outcome is set for each problem, selecting nursing interventions that will achieve the goal/outcome. The evidence-based nursing outcomes classification enables nurses to use of standardized language which lead to consistency of terminology, definition and outcome measures. Nursing care plan is the result of this phase. During evaluation phase the nurse evaluates the progress toward the goals/outcomes (**Reed, 2009, Kim2010, Sanson2017, and Grove& Gray 2018**).

Encouraging students in order to apply analytical thinking in their daily practice for increasing the patient safety need the nurse educators applying different methods of teaching. This can be carried out by adopting the instructional strategies which prepare students by knowledge needed for critical thinking. Critical Thinking and Nursing Process use concrete examples and mainly depend on exercises to help in applying the basic of decision-making process (Butcher, 2018 and Becker, 2017). Developing a concept mapping is considered the foundation to solve a case study scenario during clinical training, improve critical thinking, enhance ability to provide comprehensive approach of practicing nursing process and improve decision making in clinical settings (Popil, 2011). Critical thinking is an essential element for providing safe and quality of nursing practice. Therefore this study was done to determine the effect of applying of concept mapping for postgraduate nursing students' critical thinking on practicing nursing process.

### **Significance of the Study:**

Nowadays nursing science becomes more advanced and complex, therefore nursing educators should apply new strategies in the clinical training that help postgraduate nursing students to learn more effectively. So nursing educators have to change the traditional methods of teaching . by most recent teaching techniques. Applying concept mapping as a clinical learning activity provide high cognitive function which promote problem solving skills, provide meaningful learning and creating an effective relationships that facilitate decision making during practicing of nursing process. For this reason the study emphasized applying of concept mapping as a method of education to improve the critical thinking skills of post graduate nursing students

during practicing of nursing process.

### **The aim of the study**

To evaluate the application of concept mapping on postgraduate nursing students' critical thinking for practicing nursing process.

## **II. Subjects and Method**

### **Research hypothesis:**

Postgraduate nursing students' application of nursing process expected to be improved after implementation of educational intervention of concept mapping and critical thinking.

### **Research design:**

Quasi-experimental (pre/ post-test) design was used.

**Setting:** The study was conducted in Faculty of Nursing at Tanta University affiliated to the Ministry of Higher Education in the skill lab of Medical Surgical Nursing department and in clinical areas in (Medical unit, Burn and Cardiology department) at Tanta Main University hospital.

**Subjects:** A convenience sample of all (35) postgraduate nursing students enrolled in preparatory course in the previous mentioned setting.

### **Tools of data collection:**

Three tools were used to collect the data as follow:

**Tool (I): "A structure interview questionnaire for post graduate nursing students"** It was developed by the researchers after a reviewing of the literature. <sup>(2,4)</sup> It comprises of two parts:

**Part (1): Socio demographic data of post graduate nursing students**, which includes: age, sex, experience, work place.

**Part (2): Post graduate nursing students' knowledge assessment sheet:** It was developed by the researchers after reviewing of related literature <sup>(1,4)</sup>. It consisted of 30 questions on critical thinking and concept mapping distributed as 24 questions true and false and 6 questions multiple choices.

**Scoring system for post graduate nursing students' knowledge was:**

- Correct answer scored (1)
- Incorrect answer scored (0)

**The total scoring of post graduate nursing students' knowledge was calculated as follows:**

- Less than 65% considered poor.
- 65 - less than 75% considered fair.
- 75-100% considered good.

**Tool (II): California Critical Thinking Disposition Inventory (CCTDI):** it was developed by **Facione et al. (1994)**, to assess the post graduate nursing students' critical thinking skills. It consisted of 75 items grouped into seven subscales: truth seeking (12 items), open- mindedness (12 items), analyticity (11 items), systematic (11 items), self-confidence (9 items), inquisitiveness (10 items) and maturity (10 items). Nursing students' responses were gathered on a 6-points Likert ranging from "strongly agree" to "strongly disagree". The negative items' scores were reversed, so that a higher score indicated more positive characteristic. For each subscale the score range 10-30 indicated a more intensively negative disposition, from 31 to 39 indicated ambivalence, scores between 40 and 49 indicated increasingly positive dispositions and 50-60 suggested strong positive dispositions towards critical thinking (CT). The total CCTDI scores below 210 denoted a significant opposition, between 210- 280 falls in ambivalent range, above 280-350 positive disposition and above 350 indicated strong positive disposition towards CT. CCTDI overall Cronbach alpha was 0.92. **Facione& ,Facione 1996.**

**Tool (III): "Case study rubric for assessing nursing process "** It was developed by **Tomey& Reed** and modified by the researchers. It was used to evaluate the application of postgraduates nursing students' nursing process in clinical setting before and after educational training. It consisted of 5 phases that cover the following points: Assessment phase (4 items), nursing diagnosis phase (4 items), Outcomes identification and planning (5 items), implementation (5 items) and evaluation phase include (3 items). "

**The scoring system:** It consisted of four point categorical score (4-1) that was offered for each statement, therefore (4) means excellent and (1) means unsatisfactory. The total scoring system was 84, classified as follows:

- Satisfied nursing process 75% of the total score
- Average nursing process  $\geq 60\%$ -75% of the total score
- Unsatisfied nursing process  $< 60\%$  of the total score

## **Method**

### **Ethical considerations:**

Official permission was obtained from the Nursing faculty dean. Post graduate nursing students were informed about the purpose of the study and their rights to withdraw and the confidentiality of their data. A code number was used instead of names.

### **Validity and reliability:**

Content validity was ascertained by seven experts from Medical–Surgical Nursing and Nursing administration at Faculty of Nursing of Tanta University. Pilot study was carried out prior data collection to test the tools clarity on 10% (no.=4) of postgraduate nursing students. Pilot subjects were later included in the study as there were no radical modifications in the study tools Then the tools were adjusted and finalized. Testing reliability for each post graduate student using the nonparametric paired Wilcoxon test at the significance level of 0.05.

### **Procedure of the Study:**

Data was collected at the beginning of October to the end of March 2017.

This study was conducted on four phases' assessment, planning, implementation and evaluation technique of data collection.

#### **I-Assessment phase**

- The training was designed based on analysis of the actual educational needs assessment pre training by using the pre- constructed tools.
- Needs were taken into consideration when preparing the training intervention content.
- The postgraduate nursing students were assessed in the 1st week before starting training sessions about concept mapping using Tool (I) part (1) to collect baseline data and Tool I part (2) to assess knowledge related to concept mapping and critical thinking, to determine the duration and number of the sessions, the questionnaire sheet was filled by the postgraduate nursing students within 30 minutes.
- Tool II was assessed the post graduate nursing students' critical thinking skills
- Tool III was assessed the application of postgraduate nursing students to nursing process using rubric case study by the researchers, it carried out on 3 different case studies (burn, pneumonia, and MI) in the clinical setting to each postgraduate nursing student within 30 minutes for each one (pre- test) then calculated the average of them.

#### **II-Planning phase**

- **Based on assessment phase:**
- Objective of the study was prepared based on the aim and needs of the study subjects.
- Nursing process was formulated using concept mapping method to each postgraduate nursing student and assessed by the researchers.
- The content of concept mapping guidelines were prepared by the researchers based on the related literature. The researchers utilized the following instructional media and materials during educational sessions (power point presentation, video tape film and booklet for concept map diagram, preparing equipment as paper and color pen to train them about design of concept map in the theoretical part and simulator manikin and role play for demonstration and re-demonstration of nursing scenario situations to formulate nursing process for these case studies using concept mapping in the practical part in the skill lab.
- **III- Implementation phase**
- The postgraduate nursing students were divided into 5 groups each group composed of 7 students.
- The educational sessions were distributed over 5 sessions: 2 theoretical and 3 practical sessions for each group.
- The theoretical sessions included; **first session** was conducted before starting the application of concept mapping for each group through pretest, orientation for all post graduate nursing students about the objectives of educational program, outline and schedule, expected outcomes/benefits. The **second session** covered the following outlines; definition of concept map, objectives of concept map, types, steps of concept map, advantage and disadvantage, the difference between concept map and nursing process and

application of nursing process using concept map, training of students about how to design concept mapping based on the nursing process.

- The conduction of theoretical part was performed through lectures and group discussions, using power point, handout and videotapes as media. The theoretical part was given in one week over two sessions for 2 hours to each one, which were covered on one week.
- The practical part began at skill lab of the previously mentioned setting using scenario situation by manikin. Each group received 2 sessions (two sessions weekly for 2 hours). **First session: formulate nursing process steps** (assessment, nursing diagnosis, planning/outcome, implementation and evaluation) using concept map method . **Second session:** demonstration of case studies through nursing scenario situations using concept map method to formulate nursing process to each case study in the skill lab.

**Third session:** re-demonstration of case studies through nursing scenario situations to formulate nursing process using concept map to each studied postgraduate nursing student.

**IV- Evaluation phase:**

- Evaluation of training program was done through post test using: post graduate nursing students" knowledge assessment sheet (Tool I) part (2), Critical thinking skills using Tool II and case study rubric for assessing nursing process (Tool III) .

**Statistical Analysis:**

All data were coded, entered and analyzed using SPSS (version 20). Descriptive statistics (frequency numbers and percentages) identified demographic characteristics and students responses to the questionnaire. Chi-square test analyzes the differences and a significant difference was set at P value

**III. Results**

**Table (1):** Postgraduate Nursing Students' Data. (No.=35)

Items	No.	%	Items	No.	%
<u>Age</u>			<u>Sex</u>		
<30	23	65.7	Female	35	100
≥30	12	34.3	Male	0	0
Range	25.00-43.00		<u>Working Place</u>		
Mean± SD	28.49± 3.13		Ministry of Health Hospitals(MOH )	23	65.7
<u>Experience 'years'</u>			Tanta University Hospitals(TUH)	2	5.7
<10	32	91.4	Faculty of Nursing	10	28.6
≥ 10	3	8.6	<u>Job position</u>		
Range	2.00-20.00		Clinical nurse specialists	25	71.4
Mean± SD	5.41± 3.35		Instructors	10	28.6

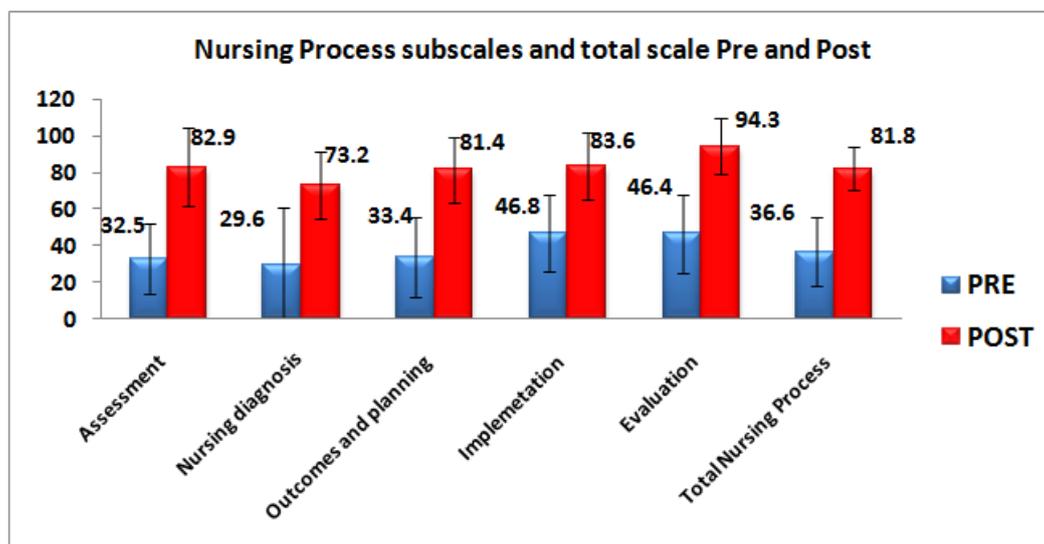
**Table (1)** shows postgraduate nursing students' data. About two thirds (65.7%) of the postgraduate nursing students fall in the age group less than 30 years with mean age 28.49± 3.13. Majority (91.4%) of them had less than 10 years of experience with mean years of experience 5.41± 3.35. About two thirds (65.7%) of them were working in Ministry of Health Hospitals. Around three quarters (71.4%) of the postgraduate nursing students were clinical nurse specialists.

**Table (2):** Postgraduate Nursing students' Application of the Nursing Process Pre and post Intervention.(No.=35)

Nursing process steps	Pre (No= 35)		Post (No= 35)	
	Range	Mean± SD	Range	Mean± SD
Assessment	0.0- 87.5	32.50± 19.22	0.0-100.0	82.86±21.24
Nursing diagnosis	0.0- 100.0	29.64±31.37	37.5-100.0	73.21±18.23
planning	0.0- 100.0	33.43±21.82	50.0-100.0	81.43±17.68
Implementation	12.5- 100.0	46.79±20.64	50.0-100.0	83.57±18.13
Evaluation	0.0- 100.0	46.43±21.13	50.0-100.0	94.29±14.96
<b>Total Nursing Process</b>	<b>7.9- 81.6</b>	<b>36.61±18.58</b>	<b>47.4-100.0</b>	<b>81.79±11.82</b>

**Table (2)** shows postgraduate nursing students' application of the nursing process pre and post intervention. This table illustrated that the postgraduate nursing students pre intervention had lowest mean scores (29.64±31.37, 32.50±19.22 and 33.43±21.82) regarding nursing diagnosis, assessment, and planning steps in nursing process respectively. These values were improved post intervention to be (73.21±18.23, 82.86±21.24, and 81.43±17.68) respectively

**Figure (1):** Postgraduate Nursing Students' Mean Percent of Nursing Process Subscales Pre and Post Intervention



**Figure (1):** illustrates postgraduate nursing students' mean percent of nursing process subscales pre and post intervention. This figure showed that pre intervention postgraduate nursing students' mean percent regarding total nursing process were (36.6%) that improved post intervention to be (81.8%). Pre intervention the postgraduate nursing students mean percent regarding all subscales of nursing process were below half (32.5%, 29.6%, 33.4%, 46.8%, 46.4%) respectively. While post intervention their mean percent regarding all subscales of nursing process were improved to be (82.9%, 73.2%, 81.4%, 83.6%, 94.3%) respectively.

**Table (3):** Postgraduate Nursing Students' Critical Thinking Pre and Post Intervention.(No.=35)

Critical thinking subscales	Pre (No= 35)		Post (No= 35)		T	P value
	Range	Mean±SD	Range	Mean±SD		
Truth-seeking	20.8- 75.0	55.12± 16.27	29.2-83.3	60.13± 12.47	-1.51	0.141
Open-minded	20.8- 79.2	54.52± 17.47	25.0-87.5	59.64± 15.02	-1.50	0.144
Analyticity	18.2- 77.3	43.38± 14.55	22.7-72.7	45.60± 14.11	0.24	0.811
Systematicity	27.3- 86.4	56.88± 14.01	18.2-86.4	60.52± 14.58	-1.01	0.318
Self confidence	11.1- 100.0	67.61± 18.35	27.8-94.4	65.24± 14.02	0.60	0.554
Inquisitiveness	0.0- 85.0	57.71± 17.71	30.0-85.0	60.57± 13.16	-0.84	0.405
Cognitive maturity	15.0- 75.0	46.43± 14.83	10.0-85.0	48.57± 14.39	-0.04	0.969
Total CT scale	18.0- 68.7	54.25± 10.70	27.3-74.7	56.40± 9.59	-0.92	0.366

**Table (3)** shows postgraduate nursing students' critical thinking pre and post intervention. There was no statistical significant differences between total critical thinking scale pre and post intervention periods. But, it was observed that the total critical thinking subscale mean score for postgraduate nursing students pre intervention was 54.25± 10.70, which improved post intervention period to be 56.40± 9.59.

**Table (4):** Postgraduate nursing students' knowledge mean scores pre and post intervention.(No.=35)

Knowledge scales	Pre (No= 35)		Post (No= 35)	
	Range	Mean± SD	Range	Mean± SD
Critical Thinking	30.8- 69.2	47.70± 9.81	69.2- 92.3	81.30± 8.41
Concept mapping	0.0 - 75.0	46.66± 15.29	66.7- 100.0	85.95± 8.76
Total score	32.0- 60.0	47.20± 6.78	72.0- 96.0	83.54± 5.80

**Table (4)** shows postgraduate nursing students' knowledge mean scores pre and post intervention. The postgraduate nursing students' knowledge mean scores were (47.70± 9.81 and 46.66± 15.29) pre intervention regarding critical thinking and concept mapping respectively. While post intervention these values were improved to be (81.30± 8.41 and 85.95± 8.76) respectively.

Figure (2): Postgraduate Nursing Students' Knowledge Levels Pre and Post Intervention.(No.=35)

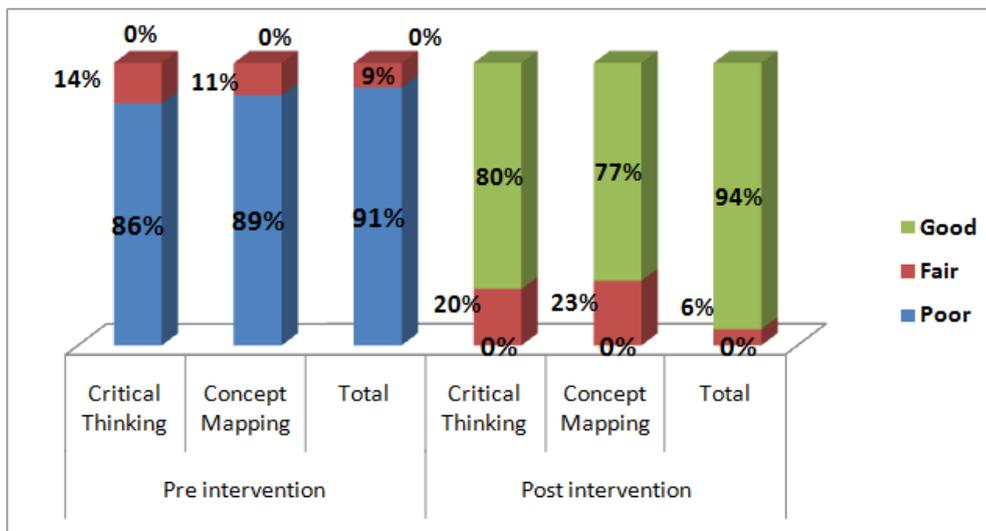


Figure (2): illustrates postgraduate nursing students' knowledge levels pre and post intervention. the majority (91%) of postgraduate nursing students had poor total knowledge level regarding critical thinking and concept mapping pre intervention, while post intervention it was improved to be (94%) of them had good total knowledge level regarding critical thinking and concept mapping.

Table (5): Postgraduate Nursing Students' Distribution according to Critical Thinking Disposition Inventory (CCTDI) Score Pre and Post Intervention.(No.=35)

Total CCTDI scale score	Pre (No= 35)		Post (No= 35)		Chi square (P)
	No	(%)	No	(%)	
Negative disposition ( $\leq 210$ )	0	(0.0)	0	(0.0)	3.09 (0.2138)
Ambivalent range (211-279)	5	(14.3)	2	(5.7)	
Positive disposition (280-350)	29	(82.9)	30	(85.7)	
Strong positive disposition ( $>350$ )	1	(2.9)	3	(8.5)	

Table (5) illustrates postgraduate nursing students' distribution according to critical thinking disposition score pre and post intervention. Majority (82.9%) of the postgraduate nursing students had a positive disposition regarding critical thinking scale pre intervention that increased to be (85.7%) post intervention. The table shows there was no statistical significant difference between postgraduate nursing students' critical thinking disposition scores pre and post intervention.

Table (6): Correlation of Postgraduate Nursing Students regarding Application scales and their Knowledge Pre and Post Intervention

Application Scales	Knowledge Pre (No= 35)			Knowledge Post (No= 35)		
	Critical Thinking	Concept mapping	Total Knowledge	Critical Thinking	Concept mapping	Total Knowledge
Nursing Process	r	.006	.126	r	-	.001
	p	.974	.469	p	.094	.687
Critical Thinking Disposition	r		-.454	r		-.085
	p		.006**	p		.627
Total Application Scales	r		.740	r		.660
	p		.000**	p		.000**

\* P > 0.05 Significant

\*\* P < 0.01 Highly Significant

Table (6) illustrates Correlation of postgraduate nursing students regarding Application scales and their knowledge pre and Post intervention . There was a high statistical significant negative correlation between postgraduate nursing students' concept mapping knowledge and their critical thinking disposition skills, where R= -0.454 & P=.006. While there was a high statistical significant positive correlation between postgraduate nursing students' total knowledge and their total application scales pre intervention, where R=0.740& P= .000.

Regarding post intervention there was a high statistical significant positive correlation between postgraduate nursing students' critical thinking disposition, total knowledge and total application scales post intervention,  $R=(.692\&.660)$  and  $P=(.000\&.000)$  respectively.

**Table (7):** Relation between Postgraduate nursing students' work places and all study scales

Scales	Working Places (No)	(Pre)			(Post)		
		Mean± SD	t	P Value	Mean± SD	T	P Value
Nursing Process	MOH + TUH (25)	34.32±19.34	-1.16	0.253*	79.26± 12.58	-2.11	0.043*
	Faculty of Nursing (10)	42.36±16.00			88.14± 6.59		
critical thinking disposition s	MOH + TUH (25)	52.46± 11.97	-1.60	0.118*	53.86± 8.80	-2.70	0.011*
	Faculty of Nursing (10)	58.73± 4.39			62.75± 8.85		
Total Knowledge	MOH + TUH (25)	45.28± 6.61	-2.93	0.006**	81.76± 5.17	-3.25	0.003**
	Faculty of Nursing(10)	52.00± 4.62			88.00± 4.99		

\*  $P > 0.05$  Significant

\*\*  $P < 0.01$  Highly Significant

MOH = Ministry of Health Hospitals

TUH= Tanta University Hospitals

**Table (7)** illustrates relation between study subjects' work places and all study scales. There were statistical significant relations between postgraduate' work places and application of nursing process per and post intervention at p value (0.253 and 0.043) respectively. Also there was statistical significant difference between study subjects' work places and critical thinking disposition scale per and post intervention at p value (0.118 and 0.011) respectively. Furthermore there were highly statistical significant differences between study subjects' work places and their total knowledge per and post intervention at p value (0.006 and 0.003) respectively.

#### IV. Discussion

In the 20<sup>th</sup> century, life expectancy has prolonged due to the increase of public health level and development of education and technology. A way to increase life expectancy is to increase the quality of patient care. **Amoueshiet. al, (2015)**. Concept mapping can be an effective teaching- learning strategy that allows a student to develop the ability to organize information in a meaningful way, allows nursing faculty to evaluate the student's understanding of the complex patient care needs **Abd El-Hay, et al. (2018)**. This study aimed to evaluate the effect of applying concept mapping on postgraduate nursing students' critical thinking for practicing nursing process.

The present study results revealed that the post graduate nursing students' application of nursing process had the lowest mean scores regarding nursing diagnosis, assessment and planning steps pre-intervention period, which improved post intervention. This result may be due to improve the critical thinking of post graduate nursing students after educational program regarding concept mapping. **This result was in agreement with Yıldırım (2011)**, who state that critical thinking is "the process of searching, obtaining, evaluating, analyzing, synthesizing and conceptualizing information as a guide for developing one's thinking with self-awareness, and the ability to use this information by adding creativity and taking risks". Nursing process is a problem- oriented model that breaks down symptoms into nursing problems utilizing nursing diagnosis. The format is logistic with a series of discrete components in unvaried sequence and inflexible. Nursing process is congruent with the perspective of measuring outcomes by benchmarking and prototyping and is useful because it encourages uniformity in practice. The focus is on looking for similarities between the patient and the expected benchmark for that day.

According to **Abd El-Hay, et al. (2018)**, who stated that concept mapping was helped students in structural knowledge on how to solve problems by searched for a solution and then implemented the care plan for the clients.

**Papathanasiou et al. (2014)**, also described a nursing care plan that provides students with a learning experience that helps them practice critical thinking and decision making skills. It is an important responsibility of nurse educators to integrate high level critical thinking skills into the nursing process in the clinical setting.

Concerning critical thinking pre-intervention our study subjects' lowest mean scores were regarding analyticity, cognitive maturity, and open-minded scales, while post intervention these values improved. Also majority of the post graduate nursing students had low total knowledge level regarding critical thinking and concept mapping, while post intervention these values were improved. These results were confirmed by **Obied and Gad (2017) and Lee (2004)**; as they found that students' receive experimental intervention had significant improvement in their critical thinking (CT) scoring rubric posttest than pretest. Also, **Nilson (2016)** reported that permitting students to apply the knowledge and skills into other domains enhance their CT skills.

**Lowenstein and Bradshaw (2001)** stated that imposing students to complex situations, and encourage them to apply discussion and debates regarding problem situations enhance their performance. (**Bastable, 2003**), **Wiliam and Thompson (2017)**, proposed that using problems based learning in adult learning provide them with opportunity to build on prior experience, integrate knowledge, and apply these knowledge in future situations. Also, they noted that problem based learning promotes teamwork thus, it encourages developing CT skills. So, using more open and flexible learning methods is crucial in nursing education.

Present study showed that majority of the post graduate nursing students had a positive disposition regarding critical thinking scale pre intervention that increased post intervention. Also there was no statistical significant difference between post graduate nursing students' critical thinking disposition scores pre and post intervention. This can be reasonable as those nursing students had previous clinical experience through four studied years in faculty of nursing .These results go in the same line with **Wu, et al (2017), Megahed (2004), Shin et al (2006) and Wangenstein et al (2010)**, they found that nursing students had a positive disposition toward CCTDI. Also, **Carter et.al. (2016)**,reported in a study, that baccalaureate nursing students' CT score was significantly higher than that of diploma students. This differed from findings of **Hong, S. and Yu (2017)**, found that nursing students' had ambivalent level regarding critical thinking disposition.

These results were confirmed by **Porter, R., (2017)** used the CCTDI in a longitudinal study of undergraduate nursing students and found that scores did not significantly increase over time in the nursing program; but there were positive relationships between CT dispositions and GPA, as well as scores on standardized registered nurse (RN) credential examinations.

**Porter R. (2017) and Meherali, S.M. (2016)** found no significant differences in scores on CCTDI and CCTST at the beginning and end of a one year program. No correlations were found between CT and age or experience in a study with 20 RN-BSN students.

**Regalla, L. (2016) and Lean Keng and AlQudah (2017)**, conducted a correlation study with practicing registered nurses to examine knowledge base, CTS, CTD, and experience on the development of CT. They concluded that "CT dispositions may be an essential ingredient of cognitive development" and that "the development of a critical thinker requires time and experience".

The current study results showed a statistical significant relation between study subjects' concept mapping knowledge and critical thinking disposition. Also between total knowledge and concept mapping knowledge pre intervention, while post intervention there was a high statistical significant positive correlation between study subjects' total knowledge, critical thinking disposition and concept mapping post intervention. Concept map is an instructional tool that stimulates students to engage in critical thinking. Nursing education presents the opportunity for the use of concept maps to assist students with organizing, analyzing, and synthesizing patient information and linking data to health care concepts.

The concept map activity involves creating a structured diagram that depicts the relationships between concepts (**Ellermann, et al, 2006) and Jaafarpour et.al. (2016)**.Text, pictures, symbols, and colors may be used to represent the data. In nursing, the use of concept maps requires students to think outside of the traditional linear fashion (**Abel & Freeze, 2006**). CM impacts the learning experience because it challenges learners to use logical reasoning to integrate patient data with relevant concepts and expand on knowledge, the activity can be used in both the classroom and clinical settings (**Eldredge et al., 2016**).

Present study results revealed in pre- intervention that the study subjects' mean percent regarding total nursing process was below average that improved post intervention. Pre intervention the study subjects' mean percent regarding all subscales of nursing process were below half. While post intervention their mean percent regarding all subscales of nursing process were improved and ranged between nursing diagnosis and evaluation steps.

In addition **Green, and Thorogood (2018)** conducted a quantitative study of 120 undergraduate nursing students to examine the relationship between learning styles and the students' aptitude for concept maps. Findings of that study indicate that learning style preference does not play a role in students' ability to perform well when using concept maps. The study is important because there has been a great deal of critique of the use of learning styles in education (i.e., students learn better when taught in a way that matches their style of

learning).

**Kostovich et al. (2007)**, showed that concept maps are an effective learning tool in nursing education, regardless of the students' preferred style of learning.

Also **Daley et al. (2016)**, reported on the use of serial concept maps to foster graduate nursing student thinking. By serial concept maps, they meant a series of maps about a specific concept that are developed over time. They stated that serial concept maps allow for a sophisticated exploration of theories, concepts, and other key issues within graduate nursing education. Serial maps also have the potential to demonstrate how student and practitioner thinking have changed over a specified period. This may have future applications in graduate education, RN education, and also the orientation of new graduates to clinical practice.

The present study illustrated that, there was statistical significant relation between subjects' work place and application of nursing process, critical thinking and total knowledge related to concept map pre and post intervention.

However the post graduate nursing students working in the Faculty of nursing was highest mean scores than whom working in the hospitals pre and post intervention periods. This may be due that the post graduate nursing students who is working in the Faculty of nursing attached closely with the academic field by the nature of their job from others working in the hospitals. **This was in line with Cheema & Mirza (2013) & Santiago (2011)** who said that in their studies about concept maps as a learning tool have shown that concept mapping can increase academic success and improve students' problem-solving skills within a subject, primarily due to students being actively involved in their education

## V. Conclusion

Concept maps are an effective learning tool in nursing education as all subscales of nursing process were improved. Also majority of the post graduate nursing students had low total knowledge level regarding critical thinking and concept mapping pre-intervention, compared to post intervention.

## Recommendations

The present study recommended that:

- Nursing education has to include concept mapping as a clinical learning activity to promote meaningful learning.
- Applying the study in a large group of the undergraduate students.
- Use comparative studies of different teaching modalities with concept mapping
- Concept maps should be included in nursing curricula as an evidence-based nursing education strategy.

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