CONCEPT MAPPING TO IMPROVE NURSING STUDENTS' PERFORMANCE IN CLINICAL AREA

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ABSTRACT

Background: *Concept mapping as a powerful instructional tool used in numerous health care professional program as medical, nursing, and pharmaceutical education to foster critical thinking and clinical reasoning that improve competency of students in interprets situation and enable them to provide optimal comprehensive care.* ***Aim:*** *This study was conducted to evaluate the effect of concept mapping training on the performance of the undergraduate nursing students.* ***Design:*** *A quasi-experimental design with pre-post assessment was used to achieve the aim of the current study.* ***Sample and Setting:*** *Random sample of 70 undergraduate nursing students divided into four groups: Medical-Surgical Nursing Labs, College of Nursing and Beni Suef University Hospital in Beni-Suef city, Egypt and General Hail Hospital and King Khalid Hospital departments, Hail city KSA.* ***Sampling technique:*** *students were consecutively recruited in the study sample according to the eligibility criteria.* ***Tools:*** *The researchers prepared an interview form including five sections: I- Questionnaire to assess socio-demographic characteristics of studied undergraduate nursing students. II- Questionnaire to asses students' knowledge about concept mapping. III- Questionnaire to asses concept map of studied nursing students regarding case study rubric.IV- Questionnaire to assess studied undergraduate nursing students regarding problem solving skills. V- Questionnaire to asses Attitude "Likert scale".* ***The main results of the present study:*** *the study results revealed that there were statistical significant correlation among total knowledge and case study, problem solving, students' attitude.* ***Conclusion:*** *it can be concluded that there were statistical significant improvements among undergraduate nursing students' knowledge about concept mapping after application in the clinical settings. In addition, there were significant improvement in the students' simulation case study rubric, problem solving skills and students' attitude after application of concept map in the clinical settings.* ***Recommendations:*** *concept mapping is necessary to use in clinical setting especially nursing faculties as efficient educational method to enhance problem-solving skills. The students in the clinical areas can train using the concept mapping as learning strategy in the clinical settings for greater number of students in the faculties, the teacher nurse about how to use concept mapping for plan the nursing care.*

Key Words: *Concept map, undergraduate nursing students, performance in Clinical area*

INTRODUCTION

Concept mapping is one of the modern teaching strategies that can overcome the problem of accumulating information and knowledge regarding medical surgical nursing field that will be quickly out dated. As well as these criteria need to be provided in nursing field to be able to achieve the patient safety. Todays, 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 in different situations **Kostovich et al (2007)**.

Wilgis (2013) added that there for Nursing students are becoming more ea-

ger learners, as the deeper and more long lasting the knowledge they gain, the more effectively they can explain and apply it in reality, at hospitals, clinics and health centers. In order to improve under graduated nurses' critical thinking, to be able to analyze, prioritize, and organize new information required for effective learning. So, it is great of importance that the roles of universities, change especially in the medical and paramedical faculties as nurses of only a store of knowledge; and teachers just store of lecturers, transfer of knowledge and learning; instead of merely learning and memorizing, students should improve their thinking and inference skills and learn how to analyze information and use it whenever needed **Chen,(2013).**

Mapping of concept (CM) is an active and modern teaching methods, under constructivism, placing the students at the center of learning activity and the teacher as a facilitator, which aims at fostering meaningful learning by students. **Yin (2012).** While **Markow (1998)** added that Concept of mapping is a powerful instructional tool that assists students to make connections between different nursing concepts.

Wang (2012) described Concept mapping as a hierarchical map structure with links to form valid propositions or linking words. General concepts are illustrated at the top of the map, and progressively more specific concepts are placed under one another to form a hierarchy. **Allen,(2012)** Added that Major concepts are circled or boxed by using Lines to show relationships or links, and the direction of the thought process is indicated with arrows. Propositional links between concepts, showing the meaning of the relationship between the two concepts, are represented by connecting lines with words that describe the relationship written along the lines.

Concept mapping is one of the teaching strategies used to enhance cognitive domain which involves the acquisition of knowledge and learning processes which include a hierarchy of skills involving processing information, constructing understanding, applying knowledge, solving problems, and conducting research **Ritch &Vhan, (2013).**

Concept mapping consists of five steps: the first step is develop a basic skeleton diagram that evolves from the clinical data where the students collect. Second step is analyze and categorize data where students place clinical assessment data, history data and treatments under the appropriate nursing diagnosis. Third step is label and analyze nursing diagnoses relationships . The fourth step is identify goals, outcomes, and nursing interventions in the numbered order for each nursing diagnosis. Final step is to evaluate client's responses where students evaluate, in writing, the client's responses **Timby and Smith,(2014)**

To help nursing students to deal with the patients in clinical field efficiently based on scientific and organized knowledge, new educational strategies in nursing education as a concept map is used. The nurse as educator has several roles as trying to help the patients to get the most accurate information, working to minimize the impact of health problems on her health, making sure that they are not inactive and isolated, but empowering them to be active agents in their health care plan **Pintrich & De Groot., (2013)**

In nursing education, concept mapping is used to promote critical thinking, empower care planning, evaluate nursing actions, solve a case study scenario during clinical training, develop ability to provide comprehensive approach to solv-

ing a problem and improve competency in clinical settings. Problem solving is a complex activity which involves a variety of components that include knowledge, concepts and principles **Popil, (2014) .**

Proficiency of nursing students is an essential element for providing safe and quality of nursing practice. For that reason, nursing students' needs broad–based preparations that include a wide scope of knowledge and skill from nursing and other related fields to meet the complex client needs .So, Concept mapping allows a student to develop ability to organize information in an expressive way, evaluate the undergraduate nursing student's understanding of the complex clients care needs, and promotes problem solving skills in the clinical setting **Senita, (2014).**

Significance of the study:

Improving the quality of nursing care and achieving the patient' safety concept, where nurses can be invaluable in preventing harm to patients and improving their health outcomes, all of that requires obtaining high levels of knowledge and skills during nursing academic studying. Today the world needs graduates who can take advantage of their diverse skills and in-depth academic knowledge in order to benefit from professional problem solving and long life learning. Later, nurses encountering fast changes in the system of health care and education systems and continually varying complex situations. Consequently, the teaching strategies should enable the learners to cope with these challenges. In line with this progress period, complexity and the rate of the nursing knowledge production is increasing steadily. Therefore, Superficial learning and incomplete information have affected the performance of nursing students in dealing with the patients and their families to prevent such problems, nursing educators should use new teaching methods that prevent superficial learning and lead to improvement of critical thinking skills, problem solving and increasing the students' memory. Concept mapping is one of the active teaching methods that can help nursing educators to train graduates who are capable of critical thinking and problem solving **Lee.et al., (2013).** Concept mapping, help students to understand concepts more deeply based on nursing process. Also, help students to visualize of patient care priorities through a holistic view of the client and provide high cognitive function, which promote problem-solving skills.

AIM OF THE STUDY

The aim of this study was to evaluate the effect of concept mapping training on the performance of the undergraduate nursing students. This aim was achieved through: 1. Training on concept mapping of four concepts (HTN, pneumonia, Burn and renal failure), 2. Comparing the performance of students in clinical area which measured by case study rubric and nursing care plan (Problem solving) and 3. Measure the students' attitude toward concept mapping..

SUBJECTS AND METHOD

1. Research hypothesis

Specifically, this study aimed to answer the following Hypothesis:

H1: After training of undergraduate students on concept mapping, their knowledge score will be improved.

H2: After using of concept mapping in clinical area by students their simulation of case study rubric and problem solving will be improved.

H3: students who will be training on Concept mapping will have a positive attitude toward Concept mapping.

II. Methodology

2. Research design

This research utilized a quasi-experimental design with pre and post assessment to achieve the aim of the current study.

3. Research Setting

The study was conducted in Medical-Surgical Nursing Labs, College of Nursing and Beni Suef University Hospital in Beni- Suef city, Egypt, General Hail Hospital and King Khalid Hospital departments, Hail city KSA.

4. Subjects

Random sample of 70 undergraduate nursing students divided into four groups. Undergraduate students who were attending Medical and Surgical Nursing clinical course rotation during first term. Exclusion criteria are previous experience with concept mapping.

5. Tools of data collections

Tool (I): Structure questionnaire sheet

It was comprised of two parts:

Part A: Socio-demographic characteristics of students, which includes students' code, age, sex, years, clinical setting area.

Part B: students' knowledge assessment sheet regarding concept mapping: It was developed by the researchers after reviewing of the related literatures **Williams, (2008**) to gather students' knowledge before and after implementation of concept mapping. It included the following: general knowledge about concept mapping as definition, importance, benefits, and characteristics of concept mapping, building of concept map as steps and design of concept map (9 questions).

Five experts from surgical nursing staff reviewed the content Validity of the tools.

The scoring system of the knowledge were as correct answer scored (1), don't know or incorrect answer scored (0). The total scoring system of student's knowledge was 9, classified into: Satisfied > 70% of the total score, unsatisfied ≤70 % of the total score. **Tool (II)** Rubric for assessing case study of concept was developed by **Farrag et al, (2014)** and modified by the researchers to evaluate the application of students' concept mapping in the clinical setting. It consisted of 6 statements about: arrangement of concept, links and linking line, hierarchical structure, content, depth of coverage and design. The scoring system: It consisted of three point categorical score (3-1) for each statement, therefore (3) means excellent and (1) means satisfactory. The total scoring system was 18, classified as follows: > 70% of the total score, unsatisfied ≤70 % of the total score. **Tool (III):** Problem solving skills assessment sheet was developed by the researchers based on current related literature.**Moyet ,(2004**). It comprised of questions based on real case study during clinical rotation in the clinical areas to assess nursing students' skills about how to cover knowledge regarding assessment, nursing diagnosis, planning, intervention and evaluation at the specific clinical area according to clinical rotation orders. The scoring system was: Done (1), Not done(0). The total scoring system was calculated and classified as the following: > 70 % of the total score, unsatisfied ≤70 % of the total score. **Tool (IV):** Attitude assessment questionnaire "Likert scale": to assess the nursing students' attitude towards the concept mapping as a teaching strategy. The researchers developed it after reviewing the related literature **Duckworth ,(2010**). Scoring system: students were asked to indicate their level of agreement using a four points Likert type scale with fixed values ranging from 1 to 4 responses per item: (1)strongly disagrees,(2)disagree,(3) agree and(4)strongly agree.

6. Ethical consideration:

The necessary permission was obtained from the Faculty of Nursing Dean and head of the previous departments. Informed consent was taken from every nursing student to participate in the study and included the right to withdrawal at any time. Confidentiality was taken into consideration regarding data collection. So, a code number was used instead of names.

7. Data collection:

The tools were tested for its content validity by a jury of five expertise in different fields of Medical & Surgical Nursing. Their thoughts were elicited regarding tools format, consistency and scoring system, it was calculated and found to be 97%. Cronbach, alpha test, calculated reliability. It was found to be 0.883.

A pilot study was conducted on 10% from study sample to test the feasibility and applicability of the tools. In addition, to determine any obstacles that may face during the period of data collection. They were excluded from the original sample.

Data collection for this study was carried out at the beginning of January 2015 to the April 2015. Process of concept mapping: The concept mapping was implemented through four phases (assessment, planning, implementation and evaluation). **Assessment phase:** the undergraduate nursing students were assessed in the 1st week before starting guidelines about concept mapping by using Tool I part B. The questionnaire sheet was filed within 30 minutes.

Planning phase: The content of concept mapping guidelines were prepared by the researchers. Diverse teaching methods were used as lectures, brainstorming, class discussions, case studies, collaborative learning groups, and CM presentation, preparing utensils as paper and color pen to train them about drawing of concept map. Concept mapping was conducted according to clinical area. There were (6) sessions in two weeks, three days per week. The time of each session would be about 1 hour.

Implementation phase: At the beginning of the study in the first week, three sessions were conducted. It contains pretest for all nursing students and providing knowledge about concept mapping as definition , the significance of CM in nursing education, benefits and characteristics. Second and third session includes awareness about steps that are needed to develop a CM, steps of nursing process. In the second week fourth, fifth and six sessions were conducted for each group according to schedule. Fourth session includes relation between concept map and nursing process, training of students about how to design concept mapping based on the nursing process. Fifth and six session includes case scenario to inform students about how to apply of concept map for problem solving in the clinical settings as: burning care, Hypertension, pulmonary tuberculosis and renal failure. The students were distributed individually in the clinical setting to collect the relevant data from the existing client to design concept mapping. They were started to collect data about client dominant complaint, nursing diagnoses, subjective and objective data that are associated with the diagnosis, medical history, diagnostic tests, treatments, and medications, nursing intervention and evaluation for each nursing diagnosis. After the students collected all data, they were started to design basic frame chart of concept mapping by using a 10×15 sheet of paper with all collected data that includes client dominant complaint, after that cluster data as clinical manifestations, diagnostic study, and medications related to nursing diagnosis.

Tie concepts and determine relationships by drawing an arrow among nursing diagnoses. Next, the students identify goals, outcomes, and nursing interventions for each nursing diagnosis. Finally, students evaluate the client's responses. At the end of each clinical area, the researchers rounded, and observed the students' working to achieve level of understanding of how to integrate the concept mapping and using in problem solving skills.

Evaluation phase: The nursing students were evaluated by using students' knowledge assessment sheet about CM (Tool I) at pre and the end of the work. Case study rubric for assessing concept map (Tool II) and Problem solving skills sheet (Tool III) were used immediately after finishing the training in clinical area. Finally, nursing students' attitude towards the concept mapping (Tool IV) was used pre-post implementation of concept mapping.

Statistical design:

The statistical Package for (SPSS) version (19) was used to analyze data. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables in knowledge, attitude and demographic data, and means and standard deviations and medians for quantitative variables. Cross tabulation, independent t-test and correlation. The level of significance for this study was set at (p = 0.05) to detect any indication of differences found in the data available.

RESULTS

Table 1 : Percentage distribution of demographic data for student participant n=70

Variable	N	%
Age		
20 - < 22yrs	48	68.6
22 - < 24yrs	22	31.4
Minimum Maximum Mean ±SD	20 24 21.98±1.22	
Sex		
male	20	28.6
female	50	71.4
Academic year		
Second year	70	100
Clinical area Chest Cardiology Burn Unit Renal	 17 17 17 19	 24.3 24.3 24.3 27.1

Table (1) shows the distribution of socio-demographic characteristics of studied nursing students. The current study result shows that the mean age of studied nursing students was 21.98±1.22 , regarding sex more than two third (71.4%) were female. The studied nursing

students were distributed equally in clinical areas (chest, cardiology and burn) with percentage 24.3% and 27.1% in renal unit.

Table2: Comparison between students' knowledge regarding concept map pre and post n=70

Variables	pretest				Post-test				p.v
	True		false		True		False		
	n	%	n	%	n	%	n	%	
A concept map is: A visual representation of a concept or idea	38	54.3	32	45.7	66	94.3	4	5.7	0.001
Never contains misconceptions does NOT apply to concept mapping	22	31.4	48	68.6	64	91.4	6	8.6	0.001
The first step of building a concept map is: Selecting subject or topic	30	42.9	40	57.1	64	91.4	6	8.6	0.001
A concept map can be used as a nursing care plan	27	38.6	43	61.4	57	81.4	13	18.6	0.001
A concept map is static and never changes despite creator's experience or knowledge.	24	34.3	46	65.7	60	85.7	10	14.3	0.001
All the following are advantages to concept mapping Except Potential to be time consuming	23	32.9	47	67.1	56	80.0	14	20.0	0.001
Legend is not an element of a concept map	24	34.3	46	65.7	66	94.3	4	5.7	0.001
Concept maps can help build critical thinking in nursing education	23	32.9	47	67.1	56	80.0	14	20.0	0.001
A disadvantage to concept mapping is :It can be time consuming to complete, especially for the novice	27	38.6	43	61.4	59	84.3	11	15.7	0.001
Total Knowledge Score **Mean ±Sd**	3.400±2.26				7.82±1.632				0.001

Chi-Square Tests and independent t-test *=Significant difference *p≤0.05 **= highly significance *p≤0.01 Ns= Non significant difference P>0.05

Table 2: describes the distribution of studied sample according their knowledge about concept map before and after intervention. The results denoted that there was an improvement in the total knowledge score between before intervention 3.4 and post intervention 7.8. There was a high statistically significant difference between before and after intervention p value <0.001.

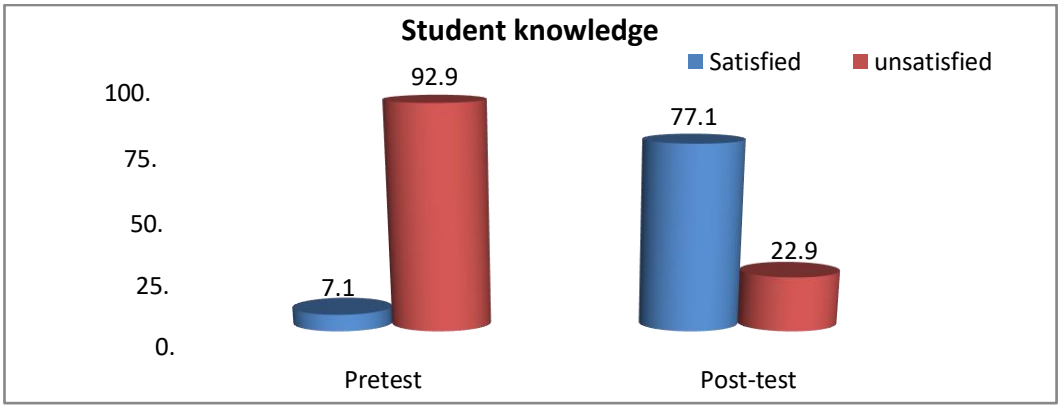
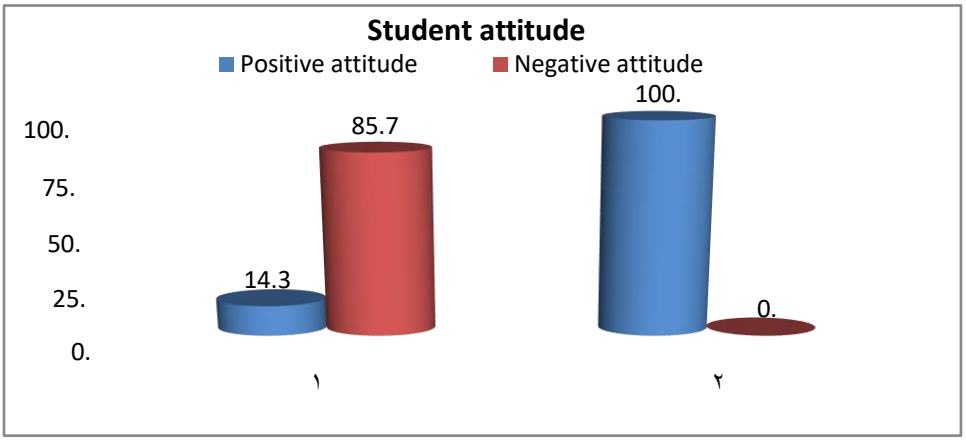


Figure (1) illustrates the distribution of studied sample regarding students 'knowledge about CM. The data reveals that the satisfied knowledge improved from 7.1% in pretest to 77.1% in posttest.

Part III: Comparison of total students 'attitude score between pre-posttest n=70



Chi-Square Tests and independent t-test *=Significant difference *p≤0.05
**= highly significance *p≤0.01 Ns= Non significant difference P>0.05

Figure (2) illustrates the distribution of studied sample regarding attitude. The data reveals that the highly statistically significant difference p≤0.01 between the positive students' attitude pre intervention (14.3%) and their attitude positive post intervention (100%).

Table 3: Assessing concept map by case study rubric in clinical area

Items	Satisfactory		Good		Excellent	
	N	%	N	%	N	%
1. Map includes the important concepts	15	21.4	44	62.9	11	15.7
2. All concepts interlinked with several other	10	14.3	52	74.3	8	11.4
3. Use of Descriptive Links (relationships)	14	20.0	29	41.4	27	38.6
4. Each link type is distinct from all others, clearly describes relationship; used consistently.(Efficiency of Links)	7	10.0	41	58.6	22	31.4
5. Map is contained in a single page using multiple clear hierarchies (Layout)	16	22.9	34	48.6	20	28.6
6. Development Over Time	9	12.9	40	57.1	21	30.0
7. Mean total case study rubric score	18.54±1.807					

Table 3: shows the distribution of studied sample according to Assessing concept map by case study rubric in clinical area; the mean total case study rubric score is 18.54±1.807

Table 4: Rubric for evaluation of problem solving and Nursing process

Items	Done		Not Done	
	N	%	N	%
1. Assessment Collecting, organizing, validating, and documenting client data.	**70**	**100.0**	**0**	**0**
2. Diagnosis Cluster, Analyze and synthesize data. Problem identification nursing diagnosis label.	**68**	**97.1**	**2**	**2.9**
3. Planning/Goal/Outcome Determining how to prevent, reduce, or resolve the identified client problems	66	94.3	4	5.7
4. Implementation Carrying out the planned nursing interventions.	70	100.0	**0**	**0**
5. Evaluation Measuring the degree to which goals/outcomes have been achieved and identifying factors that positively or negatively influence goal achievement.	55	78.6	15	21.4
6. problem solving and Nursing process mean Score	4.700±.461			

Table 4 showed that the evaluation of concept map by problem solving and nursing process in clinical area. The students were statistical significant improvement and apply all items of problem solving and nursing process with mean score of 4.700±.461 after intervention.

Table 5: Relation between total knowledge and case study , problem solving ,students' attitude

Variables		Pearson R.	p.v
Total knowledge score of Concept map	case study rubric	**.003**	**.983**
	problem solving and Nursing process	**.258***	**.031**
	Student attitude	**.477****	**.001**

Table 5: This table describes the positive correlation between knowledge, problem solving , Nursing process and Students' attitude P=0.001

DISCUSSION

As the thrift of service becomes more complicated and enhances in field of nursing, the need for using self- learning techniques is apparent. Since the objective of nursing is professional development in which a person is able to self-direct and continue their educational pathway, so, the student should gain necessary abilities of self-learning. One of the most effective strategies provided in recent years for this aim is the "concept map"(**Harpaz., et al 2014**).

The present study was implemented with the aim of evaluating the effect of concept mapping training on the performance of the undergraduate nursing students. The results of the current study achieved the predetermined aim and are expressed as follows.

The current study results showed that socio-demographic characteristics of studied nursing students, the mean age of studied stroke patients was 21.98±1.22 ; more than two third (71.4%) were female . Also; The studied nursing students were distributed equally in clinical areas (chest, cardiology and burn) with percentage 24.3% and 27.1% in renal unit.

Regarding the distribution of studied sample according their knowledge about concept map before and after intervention. The results denoted that there was an improvement in level of knowledge between before intervention and post intervention; the same line with **Wilgis & Mcconnell (2013)** who reported that

Nursing students are interested in the educational strategies that assist in more long-lasting the knowledge they gain, and the more effectively they can explain. They are concerned with applying the gained knowledge in reality at different healthcare settings through the concept map. Moreover, **Nesbit & Adesope., (2012)** reported that The most of the students assured that using concept maps in teaching EBP (evidence base practice) enabled them to recognize the concept of EBP and to connect EBP's steps to comprehend the content. They mentioned also that using of concept map helped them in retaining information, studying and preserving time. The same findings were reported in two systematic reviews and meta-analysis which indicated that concept maps were effective for knowledge retention and transformation .

Regarding the attitude of studied sample; The data reveals that the highly statistically significant difference P 0.01 between the students' attitude pre intervention (85.7%) and their attitude post intervention (100%). This results were agree with **Luchembe., et al (2013)** who reported that students had positive attitude towards concept mapping. Students indicated that they used concept mapping for revising and relating new information to the old. Additionally, students stated that they would use concept maps in other physics topics and would further use concept mapping when they start teaching in schools. Also; This view is in line with the observation made by **Karakuyu (2014)** who after carrying out a research concluded that students who used concept maps were observed to have a tendency of more positive attitude than the control group students. It is also supported by **Broggy and McClelland (2008)** who stated that the main findings from their year-long study suggest that there is a strong indication that students' attitudes towards physics improve after working with and experiencing concept maps.

As regard level of undergraduate nursing students' regarding simulation case study rubric for assessing concept map after intervention in clinical settings. The study result showed that there were statistical significant improvement in the nursing students' regarding simulation case study rubric.This finding were in the same line with **Daley et al. (2013)** who stated that the score of the study group regarding the concept map rubric was improved from the first to the last assignment. Also **Nirmala & Shakuntala (2011)** said that in their study, the comparison of pretest and post test concept map rubric scores were showed significant difference in all the aspects of concept map except for the hierarchy.

As regard to undergraduate nursing students' competency for evaluation of problem solving and nursing process, the study results denoted that there were statistical significant improvement This finding is in the same line with **Kamble & Tembe (2013)** who said that the result of their study showed that the students who was exposed to the use of concept mapping technique while studying was significantly higher in well structured problem solving than those students who exposed to traditional teaching method. In the same line **Cheema & Mirza (2013)** 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.

Also the study results revealed that there were statistical significant correlation among total knowledge and case study, problem solving ,students' attitude

; in the same line with **BouJaoude & Attieh (2008)** who reported that the result of their study showed that the total scores on the concept map showed a significant correlation with the scores on the application and level items on the posttest.

The last finding in this review was related to students' abilities to more qualified nurses in their clinical areas. Experimental studies showed that students were appreciated their abilities to consolidate, the learned knowledge in clinical settings, and they were creatively drawn concept maps for their patients including nursing care plan for each patient. Further, nursing students feeling satisfied and experiencing positive attitude toward clinical simulation after utilizing concept maps in their clinical training **Vacek, (2009)**.

CONCLUSION

In the light of the current study, it can be concluded that there were statistical significant improvements among undergraduate nursing students' knowledge about concept mapping after application in the clinical settings. Also there were significant improvement in the students' simulation case study rubric , problem solving skills and attitude after application of concept map in the clinical settings.

RECOMMENDATION

concept mapping is necessary to use in the clinical setting especially nursing faculties as efficient educational method to enhance problem solving skills; use the concept mapping as learning strategy in the clinical settings for greater number of students in the faculties; the teacher nurse can be trained about how to use concept mapping for plan the nursing care by the students in the clinical areas.

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