

Concept Mapping as an Innovative Teaching Strategy to Enhance Cognitive Learning in Nursing Administration Course

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Abstract

Background *Concept mapping is a teaching and learning strategy that establishes a bridge between how people learn knowledge and sensible learning.*

Aim *The present study aims to explore the effect of concept mapping based learning on students' cognitive learning levels in nursing administration course.*

Methods *It is a quasi- experimental study. The study was conducted in faculty of nursing –Helwan University. Subjects were composed of all 4th year students (102) in faculty of nursing –Helwan University, for the academic year 2012-2013, . Two types of Questionnaire formats were used (Students' knowledge about concept mapping questionnaire format and satisfaction questionnaire format) plus concept map assessment Rubric and students' achievement test in collecting data for this study.*

Findings *The majority of the experimental students before awareness sessions were lack knowledge about concept mapping. Also, regarding applications concept map scoring rubric assignments the majority of the experimental students had moderate score in the 1st assignment and high score in 2nd assignment. As evident, the majority of the studied students either control or experimental had low score in pre-test. While, in the post-test the majority of experimental had high score. Most of them perceived concept mapping positively as a learning tool.*

Conclusion *There was a high significant difference between experimental students' knowledge about concept mapping before and after awareness sessions, concept mapping improved students' meaningful learning levels. Finally, most of experimental students perceived concept mapping positively.*

Key words: Concept mapping, teaching strategy, cognitive learning skills, meaningful learning, students achievements.

Introduction

Effective teaching is so crucial to learning that the products of teaching such as knowledge, skills and attitude acquisition are much dependent on the teacher's effective teaching. Effectiveness of a teacher and students learning can be enhanced through the appropriate strategy adopted in a learning situation. In nursing education in recent years, the increasing awareness of the importance of learner centeredness in the teaching–learning situation has generated a lot of attention in relation to understanding how learners learn and how to help them learn about concepts (**Sandee & Hicks 2005; Chei-Chang 2008; Senita 2008; Bernstein 2011, Youssef & Mansour 2012**). Nursing students are exposed to a vast amount of information and reading material that is very specific, technical, and new to the students. Unless nurse educators provide a learning environment that promotes understanding through interaction. students might only commit unassimilated information to their short-term memory through rote learning, and no meaningful learning will occur. Nursing students must be able to link learned facts, concepts and principles with new knowledge in order to make sound rational decisions in

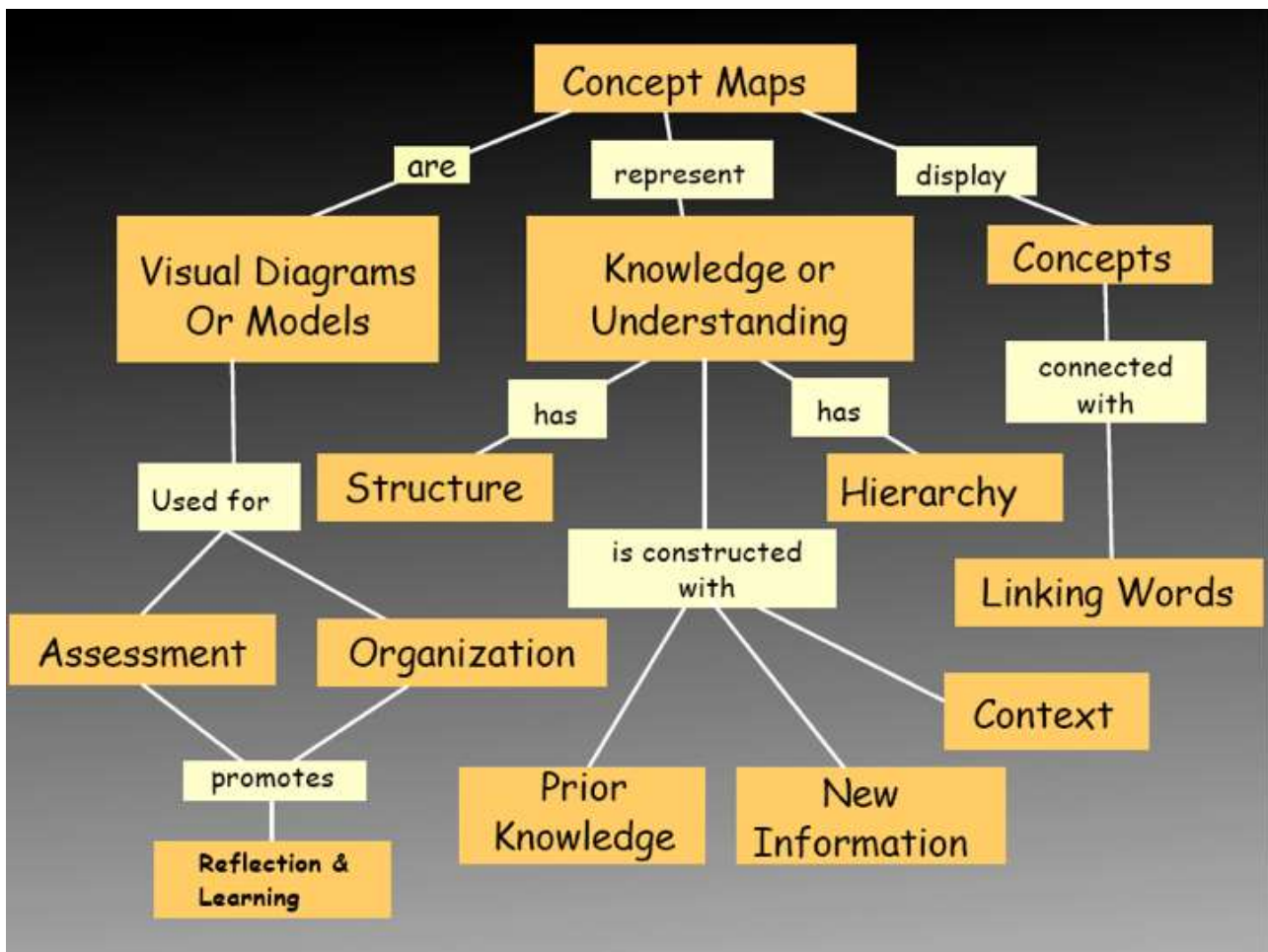
nursing practice. These efforts in assisting nursing students to learn more effectively have led to the development of metacognitive strategies to enhance meaningful learning (**Wheeler & Collins 2003; Raisa & Jeanette 2006; Rahmani et al. 2007; Sarhangi et al. 2010; Youssef & Mansour 2012**).

Learning is a complex cognitive process that occurs in individuals of all ages. Meaningful learning requires understanding of the concepts that are important components of the topic under study. Learning with understanding allows integration of new concepts with previously learned concepts and leads to retention of information in long term memory in a usable manner. Students who employ meaningful learning are expected to retain knowledge over time and they find ways to connect new information with more general prior learned material (**Novak 2002; Hsu & Hsieh 2005; Hinck et al. 2006; MacNeil 2007; Zwaal & Otting 2012**). Three key factors are associated with meaningful learning. First, meaningful learning involves the assimilation of new concepts and proposition into existing cognitive structure. Secondly, knowledge is organized hierarchically in cognitive structure, and most new learning involves placing new concepts and proposition into existing hierarchies. The third factor related to the idea that knowledge acquired rote learning will not be assimilated. Meaningful learning is most likely to occur when information presented in a meaningful way and the learner is encouraged to anchor new ideas with the establishment of links between old and new materials (**Nesbit & Adesope 2006; Rendas, Fonseca & Rosado 2006; Kassab & Hussain 2010; Khodadady 2011**).

Concept mapping (CM) is a teaching and learning strategy that establishes a bridge between how people learn knowledge and sensible learning. Students need to have sufficient foundation and a critical thinking about CM and the relations between different concepts. Concept mapping promises to be useful in enhancing meaningful learning and students' conceptual understanding. (**Novak 2002; Adeneye 2011; Jennifer 2011; Akeju, Rotimi & Kenni 2012**) has highlighted the importance of hierarchical structures within the conceptual maps. Concepts are represented in a hierarchical manner; the most general are positioned in the superior part of the map, while the specific concepts, less general ones are positioned in the lower part of the map. It is believed that one of the reasons CM is so powerful for the facilitation of meaningful learning is that it serves as a kind of template or scaffold to help to organize knowledge and to structure it, even though the structure must be built up piece by piece with small units of interacting concept and propositional frameworks *figure (1)*, (**Abu Hasheesh, Al-Mostafa & Obeidat 2011; Jennings 2012; Emmanuel 2013**).

Significance of the study

Due to the rapid changes in science, meaningful learning skills are becoming more important for nursing students who will need to keep abreast of these changes as they relate to the practice of nursing. Thus, to remain professionally competent, today's nursing students must be encouraged to become life-long meaningful learners. Concept mapping helps meaningful learning in several ways. It is an activity that provides the student with an opportunity to organize, summarize, analyze and evaluate many different ideas. Thus, it promotes the development of critical thinking skills, which can then be used for other meaningful learning activities (**Sharma 2012; KumarManoj & Rizwaan 2013; Brinkerhoff & Booth 2013**).



Figure(1) : conceptual mapping model (Novak, J.D. & Gowin, D.B 1984)

Aim of the Study

The present study aims to explore the effect of concept mapping based learning on students' cognitive learning levels in nursing administration course through:

1. Assess **Experimental** students' knowledge about concept mapping.
2. Increase **Experimental** students' awareness about concept mapping.
3. Apply Rubric System as an evaluation tool for concept map based assignment for **Experimental** students.
4. Find out whether concept mapping enhance **Experimental** students' cognitive learning levels in nursing administration course.
5. Identify **Experimental** students' perception towards concept mapping as a learning tool.

Research hypotheses

It was hypothesized that concept mapping will improve students' learning achievements in nursing administration course and most of the students will perceive concept mapping positively as a learning tool.

Subjects and Methods

Research design

It is a quasi- experimental study.

Study setting

The study was conducted in faculty of nursing –Helwan University.

Subjects

Subjects of this study were composed of all 4th year students in faculty of nursing –Helwan University, for the academic year 2012-2013, (No. = 102), whom was divided randomly into two groups; control and experimental group, each group (No. = 51). None of the students reported previous experience in concept mapping.

The experimental class utilized concept maps in teaching and learning, while the control class maintained normal traditional curriculum activities. The teacher (the researcher) and the textbooks for both classes were the same to avoid confounding effects on the experiment.

Tools of data collection:

1. Students' knowledge about concept mapping questionnaire format:

This tool was developed by the researcher after reviewing the relevant literature. It was used to assess the experimental students' knowledge about concept mapping. It included questions as definition of concept mapping, its goals, benefits, types, uses, components and steps for developing a concept mapping.

2. Concept Map Assessment Rubric

This tool developed by the researcher after reviewing the relevant literature. The rubric was developed through examining other concept map rubrics and making an outline of the major points should be included in the concept mapping.

Concept Map Scoring Rubric

Variable	Exceeds Standard 3	Adequately Meets Standard 2	Below Standard 1	score
Organization	Well organized & Logically format. Contains main concepts. All key words & concepts necessary to promote an overview of the unit are used & well organized to give added meaning.	Somewhat organized & incoherent. Contains only a few of the main concepts. Many key words & concepts from the unit are covered & are somewhat organized.	Choppy & confusing. Contains a limited number of concepts. Many key words & concepts from the unit are missing.	
Content, Concepts & Terminology	Shows an understanding of the topic's concepts & principles & uses appropriate terminology & notations	Makes many mistakes in terminology & shows a lack of understanding of many concepts Some misconceptions	Shows no understanding of the topic's concepts & principles Many misconceptions are evident.	

	No misconceptions/ errors evident.	are evident.		
Connections & Knowledge of the Relationships among Concepts	All words accurately connected. <ul style="list-style-type: none"> ▪ Connections indicate superior organization/ understanding & enhance meaning. Arrows easily connect concepts in an informative manner. Identifies all the important concepts & shows an understanding of the relationships among them. 	Most words accurately connected. Connections are somewhat clear & convey some meaning. Makes some incorrect connections.	Some words Accurately connected. Connections aren't clear, they convey little meaning & do not promote clarity. Fails to use any appropriate concepts or appropriate connection.	
			Total	

Test validity for both of this and the previous questionnaire, they were given to the 12 faculty members of Helwan, Ain Shams and Alexandria nursing faculties who had teaching experience in education and concept mapping and after receiving their comments, the necessary changes were made. The Cronbach Alpha coefficient of the instrument was 0.8 for the study sample.

3. Students' Achievement test:

This test was designed by the researcher to test the cognitive learning of the students in the nursing administration course. The test included two parts, and had 40 questions. The first 20 questions assessed the domain of knowledge understanding. Questions 20 to 40, measured the meaningful learning domain (level of perception, application, analysis, evaluation and innovation or creativity according to the Bloom's classification of cognitive objectives). In designing achievement test, the researcher first reviewed all of the course intended learning outcomes (ILOS) knowledge and intellectual parts. Based on those (ILOS) the researcher made test questions. Point (1) was assigned for correct answer to each question and point zero for each incorrect answer. The total test score was obtained from the total correct responses. Test validity was evaluated through content validity, it was tested by experts in the related field, after receiving their comments, and the necessary changes were made. The reliability of the test was obtained as 0.7.

Scoring of the Achievement test:

The total score for this test was 40

It was divided into three levels as follow;

- a. Low score level : ranged (24 – 25.5)
- b. Moderate score level : ranged (26-29.5).
- c. High score level : ranged (30-40).

4. Satisfaction questionnaire format:

This tool was developed by the researcher after reviewing the relevant literature. It was designed to investigate experimental students' perceptions towards adopting concept mapping to learn nursing administration course. The questionnaire comprised 15 items, and was rated on a three-point Likert scale from agree, uncertain and disagree. The Cronbach Alpha coefficient of the instrument was 0.85 for the study sample. The instrument had high construct validity (with a part-whole correlation of 0.91).

Pilot study

Pilot was carried out on randomly selected 10 students from the experimental group after adopting the tools to exam the content validity, clarity and reliability. The subjects of the pilot study were included in the main study sample because no modifications were done to the tool.

Procedure:

The field work of this study was executed in one year. Data collection began on September 2013 in 1st semester to the end of the semester. The researcher divided randomly of all 4th year students in faculty of nursing –Helwan University, for the academic year 2012-2013 into two groups; control and experimental group, each group (No.= 51). None of the students reported previous experience in concept mapping. The researcher started to assess experimental students' knowledge about CM using the self administered questionnaires format. The time needed to fulfill the questionnaire format was (25-35) minutes Then, a pre-test was taken before beginning of the classes by all of the students. After that awareness sessions started for the experimental group about concept mapping. The researcher then taught from the textbook using CM for the experimental group while, the control group participated in the normal traditional course. The researcher gave the experimental group two assignments using CM in them to ensure that the experimental group were well understood CM. Then corrected students-constructed concept maps according to rubric system. At the end of the semester a post-test was taken by all of the students (control and experimental) to evaluate their achievements. Finally, students in the experimental group were asked to fill out the satisfaction questionnaires to rate their perceptions towards their experiences of using concept mapping. They were also assured that their responses to the questionnaires had no effect on their scores, and that they were free to respond anonymously.

Administrative and Ethical Considerations

To carry out the study in the predetermined faculty, letter containing the aim of the study were directed from the researcher to the dean of faculty of nursing in Helwan University to obtain his permission and help to conduct the study in the faculty. The researcher obtained study subjects' approval orally after explaining the purpose and method of data collection for the study. Confidentiality, anonymity and the right to withdraw from the study at any time were guaranteed.

Statistical Analysis

After reviewing the completed questionnaires, the data was gathered and analyzed parting each section. Data entry and analysis was done using SPSS 13.0 statistical software package. Statistical significance was considered at p-value <0.05.

Results

Table (1) illustrates experimental students' knowledge about concept mapping before and post Awareness sessions. It was noticed that most of the studied sample before awareness sessions (78.43%, 84.31%, 94.12%, 100%, 96.08%, 100% & 100%) respectively were did not know definition of concept mapping, its purposes, benefits, types, uses, components of concept mapping and steps for developing it. On the other hand, as regard post awareness sessions, the majority of the study sample (88.24%, 82.35%, 86.27%, 94.12%, 90.20%, 94.12% & 100%) respectively was well known of all knowledge about concept mapping. There was a high significant ($p < 0.001$) difference between them before and post awareness sessions regarding their knowledge about concept mapping.

Regarding application of concept map scoring rubric for experimental group assignments **table (2)** shows that the majority (86.27%) of the studied students had moderate score in the 1st assignment and only (13.73%) had high score, while, in the 2nd assignment (90.2%) of them had high score and only (9.8%) had moderate score. On the other hand no one in both assignments had low score.

While, concerning pre and post-test results of control and experimental group **table (3)** displayed that the majority of the studied students either control or experimental had low score in pre-test (86.27% & 82.35%) respectively. Mean while, in the post-test the majority of experimental had high score (76.47%) and in contrast the majority of the control students had moderate score (49.01%). There was no significant ($p < 0.05$) difference between control and experimental group in pre-test, while, there was a high significant ($p < 0.001$) difference between them in post-test.

Table (4) revealed experimental students' perceptions towards concept mapping as a learning tool. As evident, most of them perceived concept mapping positively as a learning tool (94.12%, 90.20%, 98.04%, 96.08%, 98.04%, 92.16%, 92.16%, 96.08%, 96.08%, 98.04%, 94.12%, 98.04%, 90.2% & 86.27%) respectively in all items.

Table (1): Experimental Students' Knowledge about Concept Mapping before and post Awareness Sessions

Items	Students' knowledge (<i>Before</i> awareness sessions) (n= 51)		Students' knowledge (<i>Post</i> awareness sessions) (n= 51)		P-value
	No.	%	No.	%	
Definition of Concept Mapping					
Complete definition	0	0	45	88.24	<0.001
Incomplete definition	11	21.57	6	11.76	<0.001
Do not Know	40	78.43	0	0	<0.001
Purposes of Concept Mapping					
Complete	0	0	42	82.35	<0.001
Incomplete	8	15.69	9	17.65	<0.05
Do not Know	43	84.31	0	0	<0.001
Benefits of Concept Mapping					
Complete	0	0	44	86.27	<0.001

Incomplete	3	5.88	7	13.73	<0.001
Do not Know	48	94.12	0	0	<0.001
Types of Concept Maps					
Complete	0	0	48	94.12	<0.001
Incomplete	0	0	3	5.88	<0.001
Do not Know	51	100	0	0	<0.001
Uses for Concept Maps					
Complete	0	0	46	90.20	<0.001
Incomplete	2	3.92	5	9.80	<0.001
Do not Know	49	96.08	0	0	<0.001
Components of Concept Maps					
Complete	0	0	48	94.12	<0.001
Incomplete	0	0	3	5.88	<0.001
Do not Know	51	100	0	0	<0.001
Steps for Developing a Concept Map					
Complete	0	0	51	100	<0.001
Incomplete	0	0	0	0	
Do not Know	51	100	0	0	<0.001

(*) statistically significant at $p < 0.05$

Table (2): Application of Concept Map Scoring Rubric for Experimental Group Assignments

Score	1 st assignment		2 nd assignment	
	No.	%	No.	%
High Score	7	13.73	46	90.20
Moderate Score	44	86.27	5	9.80
Low Score	0	0	0	0

Table (3): Pre and Post-test Results of Control and Experimental Group

Test	Control Group (n= 51)				Experimental Group (n= 51)				P-value	
	Pre-test		Post-test		Pre-test		Post-test		Pre-test	Post-test
	No.	%	No.	%	No.	%	No.	%		
Achievement test										
Low Score	44	86.27	20	39.21	42	82.35	3	5.88	<0.05	<0.001
Moderate Score	7	13.7	25	49.01	9	17.65	9	17.65	<0.05	<0.001
High Score	0	0	6	11.76	0	0	39	76.47		<0.001

(*) statistically significant at $p < 0.05$

Table (4): Experimental Students' perceptions towards Concept Mapping as a learning tool

Perceptions	No.	%
1. Concept mapping helped me learn course of Nursing Administration.		
Agree	48	94.12
Uncertain	2	3.92
Disagree	1	1.96
2. Concept mapping helped me integrate and clarify the interrelationships among course contents		
Agree	46	90.20
Undecided	3	5.88
Disagree	2	3.92
3. Concept mapping learning strategy stimulated me to learn and think independently		
Agree	50	98.04
Undecided	1	1.96
Disagree	0	0.00
4. Concept mapping helped me reduce the barriers and enhance my interest in learning course of Nursing Administration.		
Agree	49	96.08
Undecided	2	3.92
Disagree	0	0.00
5. Concept mapping can be a new teaching and learning approach		
Agree	50	98.04
Undecided	1	1.96
Disagree	0	0.00
6. I think the concept mapping strategy can be easily used in other curricula.		
Agree	47	92.16
Undecided	2	3.92
Disagree	2	3.92
7. I will consider using the concept mapping learning strategy in other curricula		
Agree	47	92.16
Undecided	2	3.92
Disagree	2	3.92
8. I was satisfied with using concept mapping to learn course of Nursing Administration.		
Agree	49	96.08

Undecided	1	1.96
Disagree	1	1.96
.I liked using concept mapping to assist me to learn Nursing Administration course.		
Agree	49	96.08
Undecided	2	3.92
Disagree	0	0.00
0. I can soon adapt to concept mapping.		
Agree	50	98.04
Undecided	1	1.96
Disagree	0	0.00
1. Concept mapping is very creative		
Agree	48	94.12
Undecided	2	3.92
Disagree	1	1.96
2. Concept mapping improved my thinking.		
Agree	50	98.04
Undecided	1	1.96
Disagree	0	0.00
3. My mind was alert while doing concept mapping		
Agree	50	98.04
Undecided	1	1.96
Disagree	0	0.00
4. Concept mapping is saved my time.		
Agree	46	90.2
Undecided	2	3.92
Disagree	3	5.88
5. It is very challenging to make concept mapping		
Agree	44	86.27
Undecided	2	3.92
Disagree	5	9.80

Discussion

Concept mapping is an educational tool that is used to facilitate and demonstrate student comprehension through the use of a visual medium. Because it provides a non-linear, multidimensional way of exploring a topic. However, the present study revealed that most of the studied sample was not aware of its definition and purpose. These findings were inconsistent with (Lavigne 2005; Chei-Chang 2008; Bernstein 2011) who emphasized that concept mapping is a diagram, which organizes information, contains links, clusters data, and visually demonstrates relationships between data. This was supported by (Abu Hasheesh, Al-Mostafa & Obeidat 2011; Jennings 2012) who asserted that concept maps are graphical tools for organizing and representing knowledge, and seeking new knowledge. This also agreed by (KumarManoj & Rizwaan 2013) who found that concept mapping is a technique used to represent the relationships among concepts in a two

dimensional graph and it is a procedure that is used to measure the structure and organization of an individual's knowledge.

Meanwhile, regarding benefits of concept mapping, (**Sandee 2005; Sarhangi et al. 2010; Youssef & Mansour 2012**) stated that concept maps offer a method to represent information visually. In which visual learning techniques help students clarify thinking, reinforce understanding, integrate new knowledge and identify misconceptions. On the same line (**Yaowalak 2005; Hinck et al. 2006; Saouma & Attieh 2008**) found that concept mapping in healthcare environment improves student's ability to assess patients holistically, synthesize complex patient data, and build relationships among data. This was supported by (**Rendas, Fonseca, & Rosado 2006; Zwaal & Otting 2012**) who asserted that concept mapping guides students and novice nurses to link theory to practice. This was similar to (**Nesbit & Adesope 2006; Kassab & Hussain 2010; KumarManoj & Rizwaan 2013**) who emphasized that it promotes and allows a multidisciplinary approach to patient care. All of the above was inconsistent with the results of the present study. Furthermore, several types of structures have been proposed for concept mapping. It was noted from the present study that no one mentioned types of concept maps. These findings were inconsistent with (**Nirmala & Shakuntala 2012; Brinkerhoff & Booth 2013**) who stated that concept maps have several structure such as hierarchy, cyclic chain, spider-maps, and networks that could be used to mentally represent the knowledge embedded in one's long-term memory.

In fact, concept mapping is the presentation of the association schema of a concept with another concept and their relation with other concepts related to the specific subject that is sorted in a hierarchical model. All concept maps have three components, (**Hay, Kinchin & Lygo-Baker 2008; Emmanuel 2013**) asserted that concept maps components are nodes represent concepts; lines represent relations between concepts, arrowheads indicate direction and labels on the lines describe the nature of the relationship. Combined, these three components create propositions or meaningful statements. These findings were inconsistent with the present study, which revealed that all of the study sample before awareness sessions were not aware of the components of concept maps.

Concept maps are diagrams of key concepts and relationships between those concepts. However, regarding steps for developing a concept map, the results of the present study revealed that all of the study sample was lack knowledge about it. These findings were in contrast with (**MacNeil 2007; Kassab & Hussain 2010; Khodadady 2011**) who found that in developing the concept map, the main concept is placed at the top or center and other concepts are arranged from top to bottom; some lines are drawn between concepts and the communicative sentences are written on the lines. On the other hand (**Alireza, Ali & Davood 2012; Barchok, Too & Ngeno 2013**) who emphasized that steps for developing concept maps in healthcare, occurs through main five steps as follow: develop a basic diagram, analyze then categorize collected data, label diagnosis and link the data, identify goals, interventions and outcomes and finally evaluate patient responses.

Improving educational quality requires placing learners in active rather than passive roles. 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 (**Materna 2000; Wheeler & Collins 2003; Harpaz; Balik & Ehrenfeld 2004; Clayton 2006; Sarhangi et al. 2010**). In the present study, CM helped most students synthesize and reflect on topics covered in the course which evaluated through a concept map rubric method, the study revealed that most of student exceeds standard, and that supported with (**Bamidele & Oloyede 2013; Brinkerhoff & Booth 2013**) through assuring that creating concept map assignments with more specific instructions, geared toward conceptual understanding and help facilitate greater overall academic improvements. This was

supported by (Qarareh 2010; Khodadady 2011; Youssef & Mansour 2012; Zwaal & Otting 2012) who found the same results.

However, there have been relatively few research studies which have evaluated the usefulness of CM in university-level education courses. It was interesting that the present study revealed that the result obtained seems to suggest that the CM strategy more effectively improved the students' learning achievement than the traditional expository teaching method. These findings were consistent with (Ellermann; Kataoka_ & Wong 2006; Sharma 2012; KumarManoj & Rizwaan 2013) who emphasized that CM teaching approach is based on meaningful learning, and learning occurs when the learner is able to organize and relate the concepts and new information with his/her cognitive mental structures. This was supported by (Freeman & Jessup 2004; Chiou 2009; Abu Hasheesh , Al-Mostafa & Obeidat 2011; Jennings 2012; Meng-Lei & Ming 2012) who asserted that people learn by being engaged actively, and a person is not an empty vessel to be filled with information. Knowledge that empowers and increases the learner's self-confidence is that which results from the coming together of individual actions, feelings, and conscious thoughts (Novak 2002). This also agreed by (Chularut & DeBacker 2004; Yaowalak 2005; Ajaja 2011) who stated that CM is regarded as a good technique to encourage students' learning in a higher education setting in the UK, USA and Taiwan.

The students' responses to the satisfaction questionnaires appeared that most of them agreed that CM helped them to learn nursing administration course, also integrate and clarify the inter-relationships among curriculum content. Furthermore, most of the students indicated that CM stimulated them to learn and to think independently. These findings were consistent with (Hay 2007; Hines 2010; Bernstein 2011; Tseng et al. 2012) who found that (92%) of his students agreed that concept maps make the mind fresh when it is tired and (82%) said that their thinking was kindled while doing mapping. (95%) felt that concept maps make them a critical thinker as it stimulate lateral thinking. This was supported by (Bernstein 2011; Youssef & Mansour 2012; Nirmala & Shakuntala 2012; Barchok , Too & Ngeno 2013) who found in their study that students have positive opinion regarding using concept maps and they have expressed that if they are taught to use concept maps from the first year, it will be one of the best method to learn.

Conclusion

According to the study findings, it was concluded that there was a high significant difference between experimental students' knowledge about concept mapping before and post awareness sessions. While regarding applications of concept map scoring rubric assignments the majority of the experimental students had moderate score in the 1st assignment and high score in 2nd assignment. Furthermore, CM improved students' meaningful learning levels. Finally, most of experimental students perceived CM positively.

Recommendations

Based on the study findings, the following recommendations were suggested:

1. Nursing educational programs should introduce this innovative teaching learning strategy in different nursing courses.
2. Special training may be required for the nursing educators (faculty staff members) to get oriented and acquire skill in adapting CM as an innovative teaching and learning strategy.
3. Nursing educators should empower their students to use concept mapping strategy in all nursing courses.

4. Further replication of this study in other nursing courses, at other universities and other competencies could be conducted.
5. Further follow-up study of graduate nurses about the impact of concept mapping on acquiring nursing competencies should be initiated.

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