The Impact of Concept Mapping Skills Intervention Versus Traditional Nursing Education on Academic Achievement of Pediatric Nursing Students

*Nadia Ibrahim Mahmoud, **Wafaa El- Sayed Ouda, **Randa Mohamed Adly

*MD in Pediatric Nursing - Faculty of Nursing- Ain Shams University

**Professors of Pediatric Nursing -Faculty of Nursing - Ain Shams University

Abstract: **Concept mapping is a teaching and learning strategy that promotes students' meaningful learning and has demonstrated potential effects in the nursing education process. Aims of the study: This study aimed to assess the students' knowledge regarding concept mapping, design and implement maps in classroom lecture, evaluate the effect of mapping skill intervention on students' achievement in pediatric nursing and compare between mapping skill intervention versus traditional nursing education on students' achievement in pediatric nursing course. Research design: A quasi-experimental design was used. Study setting: The study was conducted at the classroom lecture in Faculty of Nursing affiliated to Ain-Shams University. Subjects: The subjects included the third year students (n=85) enrolled in pediatric nursing course, during the academic year 2015-2016, divided into; control group (40 students) subjected to traditional nursing education and study group (45 students) subjected to mapping skill intervention. Tools of data collection: A structured Questionnaire Sheet, Concept Map Assessment Rubric developed by Taie, (2014), Students' Achievement Test and Student's Openionaire Sheet. The results: Revealed that, there was statistical significant difference between concept mapping knowledge of the study group pre/post intervention. The majority of students in the study group had higher scores of achievement compared with the control group post intervention. There was statistical significant difference regarding the application of concept mapping skills and the achievement scores among the students in the study group post intervention. In addition, most of students in the study group were satisfied with concept mapping as a learning tool. In conclusion: Mapping skill intervention improved the nursing students' achievements in pediatric nursing course compared with traditional nursing education. The study recommended: Training for the nursing students to acquire concept mapping skills as a learning strategy in their education.**

Keywords: **Concept mapping, Students' achievement, Pediatric nursing, Education.**

1. INTRODUCTION

In the last years, the nursing body of knowledge has increased remarkably and simultaneously as well, the nursing education and health care systems became more complicated. Consequently, nursing educators realize the importance of looking at the nursing education process. It is predictable more than ever to prepare graduate nurses who are competent, knowledgeable and skillful; subsequently safe and quality practice can be achieved. Therefore, undergraduate nursing curriculum and their related teaching and learning practices must be comprehensively re-evaluated **(Khrais and Saleh, 2017)**.

The current nursing education aims, not only to provide an appropriate level of knowledge and skill performance to nursing students, but also is expected to improve problem solving, decision making and critical thinking abilities in different circumstances **(Abd Elhay, et al., 2018)**.

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Although, traditional method of education teaches the students a certain amount of information, related to many specialties, it does not equip them with the tools that improve students' critical thinking, to be able to analyze, prioritize and organize new information required for effective learning. Lecture, is one of the most common traditional methods of teaching in nursing education, it helps in the development of knowledge and recall only and end up in rote learning, in which the students acquire the information mainly through memorizing and recalling of facts **(Pishgooie, et al., 2019)** .

The roles of universities, change, especially in the nursing faculties as nurse educators just transfer of knowledge and student nurse of only a store of knowledge. Also, 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 **(Aghakhani, et al., 2015).** Concept Mapping (CM), is a powerful teaching and learning technique for nursing education that facilitates meaningful learning. It is an active learning strategy that can be used along with or in-place of traditional lecture to promote critical thinking **(Bradshaw and Hultquist, 2017).**

The ultimate goal of professional nursing is providing high quality care to patients in all fields and especially in pediatric nursing field, where pediatric patients have higher acuity and their health status can change rapidly. The type of care provided is becoming more complex and require high levels of cognitive thinking, problem solving and critical thinking capabilities. Therefore, nursing educators should use new teaching methods that prevent superficial learning and lead to improvement of critical thinking skills, problem solving and increased memory. Concept mapping help the pediatric nursing student to provide competent nursing care, to acquire, maintain and continuously enhance the knowledge, skill, attitudes and judgments required to meet the needs of the ill child **(George, et al., 2014 and Giddens, et al., 2017)**.

Significance of the study

Nursing education encounter many challenges and continuously attempt to improve teaching and learning strategies in theory and practice. Due to rapid changes of science, meaningful learning are becoming more important for nursing students who will need to keep abreast of these changes that relate to the practice of nursing. To remain professionally, competent, nursing students who are the future nurses needs to be critical thinkers, problem solvers and lifelong meaningful learner. Use of concept mapping activities in learning process improves students' critical thinking and meaningful learning activities. Furthermore, concept mapping enables the students to evaluate what have learned and what need to learn**.**

Aim of the study

This study aims to:

1. Assess the students' knowledge regarding concept mapping.

2. Design and implement maps in classroom lecture

3. Evaluate the effect of mapping skill intervention on students' achievement in pediatric nursing.

4. Compare between mapping skill intervention versus traditional nursing education on the students' achievement in pediatric nursing.

Research hypotheses

Mapping skill intervention will improve the students' achievements in pediatric nursing course versus the traditional nursing education and most of the students will perceive the concept mapping positively as a learning tool.

2. SUBJECT AND METHODS

Research design:

A quasi- experimental design was used to conduct the study.

Setting:

The study was conducted at classroom lecture in the Faculty of Nursing affiliated to Ain-Shams University.

Subject:

A purposive sample was included in the study, their number was 85 in the 3rd year students and enrolled in Pediatric Nursing Department, during the second semester in academic year 2015-2016. The students were divided randomly into two groups: Where the first group (control group) included 40 students were subjected to traditional nursing education offered by the teaching staff of pediatric nursing department.

The second group (study group) included 45 students were subjected to mapping skill intervention.

Inclusion criteria:

Only students who were enrolled in the Pediatric Nursing course for the first time was included in the study**.**

Exclusion criteria:

Students who were repeating the third year (Pediatric Nursing course) because they had previous knowledge which may affect the result of the study.

Tools of data collection:

Data were collected through the use of the following tools:

I) Structured Questionnaire Sheet by Interviewing (pre/ post intervention)

Part (1)

This part was used to collect data about characteristics of the students namely: age, sex and previous qualifications.

Part (2)

This part was concerned with the studied students' knowledge about concept mapping regarding; definition, purpose, types, uses, components, steps, advantages and disadvantages of concept mapping. A Pre/post-test was administered before and after implementation of the concept mapping skills. The student' knowledge regarding concept mapping consisted of 8 questions. It was scored as: (One mark) for correct answer to each question and (zero) for each incorrect answer. Accordingly the student's total knowledge level was considered poor if the total score was less than 60%, average for score ranged from 60% to less than 75% and good for 75% or more.

II) Concept Map Assessment Rubric (pre/post intervention)

This tool was adopted from **Taie**, **(2014)**, to assess the studied students' progress and effectiveness of using mapping skills pre/post in classroom lecture. The rubric included 4 items related to organization, content, connection & relationships among concepts and graphics used in concept mapping implementation. Each item has 3 responses where, exceeds standard (3), adequately meets standard (2) and below standard (1). The total scores ranged from 4 to 12. Score less than 8 considered below standard. Score 8 represented that concept map adequately meet standards and more than 8 scores considered exceeds standard.

III) Students' Achievement Test (pre/post intervention)

This tool was designed by the researcher after reviewing the entire course Intended Learning Outcomes (ILOS) of pediatric nursing course. Students' achievement test used to assess the students' knowledge regarding the concepts covered in the respiratory disorders unit of pediatric nursing course. The test was consisted of three parts; the first part consisted of (25) multiple-choice questions, the second part consisted of (10) true / false questions and the third part consisted of (5) matching questions. The total questions were 40 questions. This tool was used for both groups (control & study) before and after implementation of concept mapping skills. The students' achievement test was scored as one mark for correct answer to each question and (zero) for each incorrect answer. The total test score was (40 Marks) that was classified as: poor (low score level) if the score less than 60%, average (moderate score level) if the score ranged from 60% to less than 75% and good (high score level) if the score was from 75% or more.

IV- Students' Openionaire Format

This tool was developed by the researcher to assess the study group students' satisfaction towards using of concept mapping skills in learning pediatric course, it was used post intervention for the study group. The opinionnaire sheet was consisted of 12 items and was rated on a three-point Likert-type scale that ranged from strongly agree (3), agree (2) and disagree (1). Total grades were (36). The students in the study group were classified as either satisfied, (positive opinion) if grades were 60% or more or were unsatisfied, (negative opinion) if grades less than 60%.

Pilot study

A pilot study was conducted on 10% of the total sample size of the studied subjects to evaluate the clarity and the applicability of the study tools and to estimate the time needed to fill data gathering tools. After obtaining the result of the pilot study, the ambiguous items were omitted; other items were added or modified according to the study subject's response then final form was developed. Students included in the pilot study were excluded from the study sample later.

Content validity

The designed tool of the study was reviewed by 5 panel experts in the field of pediatric nursing to test the content validity. Modifications of the tools were done according to the panel judgment on clarity of sentences, appropriateness of content and sequence of items.

Reliability

The internal consistency was measured to identify the extent to which the items of tools measure the same concept and correlate with each other. The Cronbach Alpha coefficient of the tools was 0.68 for concept mapping knowledge tool and was 0.78 for the achievement test.

Administrative design

An approval to conduct this study was obtained from the Dean of Faculty of Nursing, Ain-shams University through an official letter. Aim of the study had been illustrated and the expected outcomes of the study as well.

Ethical considerations

An ethical approval was obtained from the Scientific Research Ethical Committee in the Faculty of Nursing before conducting the study. A verbal consent was obtained from each student to ensure willingness to engage in the study. Clear and simple clarification of the study nature and its expected outcomes were explained. The students were secured that all data collected was treated in confidentiality and anonymity and used for the research purpose only. All the study subjects have the right to withdraw at any time from the study.

Field work

Assessment phase:

Data collection for this study was carried out in a period from the 1st of March until the end of May, 2016. The students were divided randomly into two groups; study and control groups, according to their serial number in attendance sheet (one by one selection). The respiratory disorders unit in pediatric were taught by the academic staff in pediatric department for all students (control & study groups) While concept mapping skills intervention was taught by the researcher for the study group only. The study was carried out in the following phases; planning, implementation and evaluation.

Planning phase:

At this phase, tools of data collection were developed. Then concept maps were designed by the researcher applied to the respiratory disorders unit in pediatric nursing course.

Implementation phase:

This phase done through eight sessions for the study group preceded by an **orientation session**, which lasted for two hours done by the researcher for both groups (at the same time) to clarify the aim of the study, steps to be followed. As well, time allowed and number of sessions for completion of this study. The pretest was taken before beginning of the lectures by all students to assess their knowledge regarding specific concepts covered in respiratory disorders unit. The

time needed to fulfill the questionnaire format was 45 minutes. Then students were divided randomly into two groups (study & control), according to their serial number in the attendance sheet.

The researcher conducted the sessions with the students in the study group two times per week for 4 weeks. The 1st session lasted for two hours, the second session lasted for an hour and half then the following sessions lasted for one hour for each, except the last session which lasted for two hours.

During the first session, the students in the study group were assessed for their knowledge about concept mapping (the pretest took 15 minutes). Then, an overview about concept mapping (the meaning, purpose, uses, types, benefits and its application).

In the second session, the steps for constructing concept mapping were illustrated. Then the students were divided into small groups (six to seven students in each group). Each group were trained for application and construction of different types of concept mapping, through sharing in different motivational teaching activities as case based scenario and brain storming. Then the students were asked to prepare their first concept mapping individually (1st assignment) for pre-intervention purpose of the study.

From the 3rd session to the 7th session, the researcher direct the students to construct concept mapping applied to pediatric respiratory disorders unit. Each student was asked to design and construct concept mapping related to respiratory disorders (namely; bronchial asthma, acute-nasopharyngitis, croup, otitis media and tonsillitis). The concept mapping constructed by the students were corrected by the researcher according to the rubric scoring system and feedback was given to them for modifications and more improvement in the subsequent mapping.

Evaluation phase:

In the last session (the 8th session). Post test about concept mapping skill intervention was distributed to the students in the study group by the researcher to ensure their understanding of the concept mapping. Each student in the study group were asked to construct concept mapping individually (2nd assignment) for post-intervention. In addition to, the opinionair sheet that was held to the study group to assess their satisfaction towards using of concept mapping skills in learning pediatric nursing course. Post test was used to evaluate students' achievements through assessment of their knowledge regarding pediatric respiratory disorders (for both study & control) groups). Finally, the researcher gratefully acknowledged all students who participated in the study for their participation and cooperation.

Statistical design:

The collected data were organized, revised, tabulated and analyzed using number and percentage distribution. Statistical analysis was done by computer using Statistical Package of Social Science (SPSS) program version 21. Data were presented using descriptive statistics in the form of numbers and percentages for qualitative variables and means and standard deviation for quantitative variables. Qualitative variables were compared using chi- square test, while quantitative variables were compared using paired t- test analysis to test statistical significance of some variables in the same group while Independent t-test to test statistical significance of some variables in the two groups. Pearson correlation analysis and Wilcoxon signed rank test (Z-score) were used for assessment of the inter-relationships among quantitative variables.

3. RESULTS OF THE STUDY

Table (1) revealed that, the mean age of students in the study and control groups was 21.31±0.73 & 21.25±0.70 years respectively. More than three quarters of the students in study and control groups were females (75.6% & 77.5%) respectively and the majority of them (86.7% & 95.0%) among the study and control groups respectively had secondary school level of education. with no statistical significant difference between the study and control groups' characteristics.

Figure (1) in relation to the students in the study group' the total level of knowledge regarding concept mapping, this figure clarified that most (84.4%) of the students in the study group had poor level of knowledge pre intervention, compared to almost three quarters (75.6%) of the students had good level of knowledge regarding concept mapping post intervention.

Figure (2) revealed that, the majority of both groups (study & control) had poor level regarding their knowledge about respiratory disorders pre intervention, as evident by 86.7% & 82.5% of them respectively. While, 82.2% of the study group had good level post intervention, compared to 55% of the control group.

Figure (3) as regards the distribution of the students in the study group according to their concept mapping skills, this table revealed that, all the students in the study group were below standard level regarding total rubric scores of concept mapping pre intervention compared to two thirds (66.7%) of them were exceeding standard post intervention.

Figure (4) in relation to the students in the study group satisfaction regarding concept mapping, this figure showed that, more than three quarters of students in the study group (80%) of them were satisfied with concept mapping as a learning tool while the rest of them (20%) were unsatisfied.

Table (3) showed that, there was no statistical significant correlation between the total students' knowledge regarding concept mapping and their total achievement scores in the study group pre intervention. While there was a highly statistical significant correlation post intervention r =0.73.

Table (4) clarified that, there was statistical significant correlation r =0.69 between the students' concept mapping skills and their achievement scores in the study group post intervention.

Table 1: Distribution of the Students in Study & Control Groups according to their Characteristics (n=85).

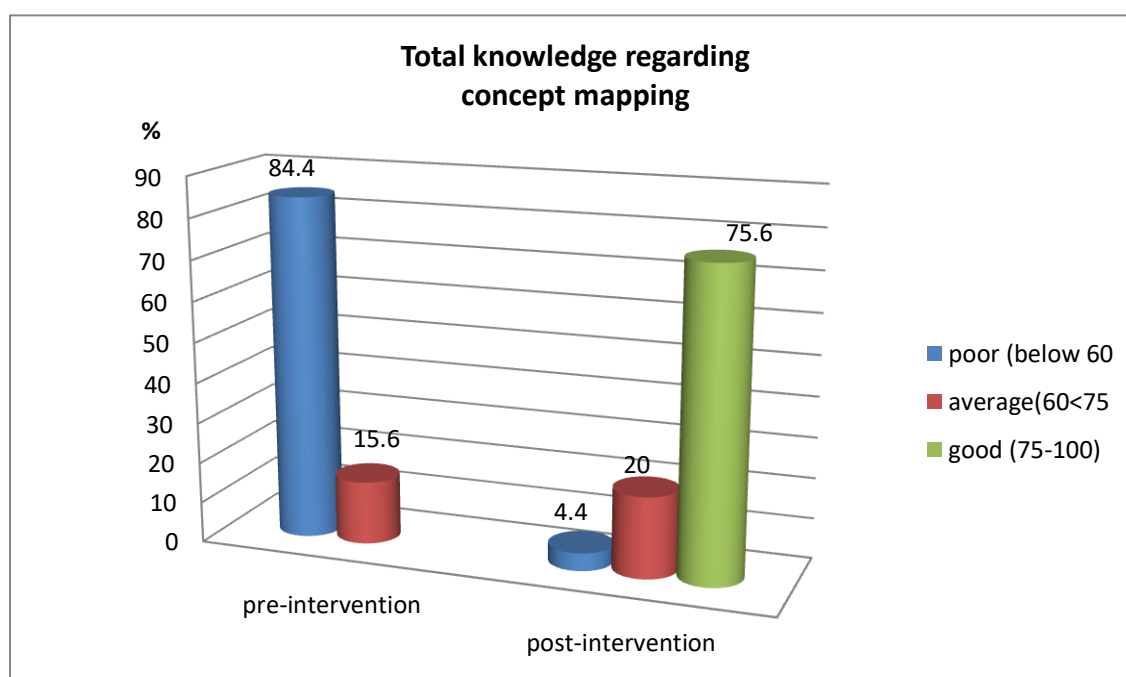| Item	The studied subjects				X^2	P-value
	Study (n=45)		Control (n=40)			
Student's age (years)	No.	%	No.	%	0.16	0.68
20 < 22	38	**84.4**	35	**87.5**		
22 < 24	7	15.6	5	12.5		
X ± SD	21.31±0.73		21.25±0.70			
Gender						
Male	11	24.4	9	22.5	0.04	0.83
Female	34	**75.6**	31	**77.5**		
Previous qualification						
Secondary school	39	**86.7**	38	**95.0**	1.72	0.18
Technical nursing diploma	6	13.3	2	5.0		

Figure 1: Distribution of the Students in the Study Group according to their Total Level of Knowledge regarding Concept Mapping (Pre/Post Intervention) (n=45).
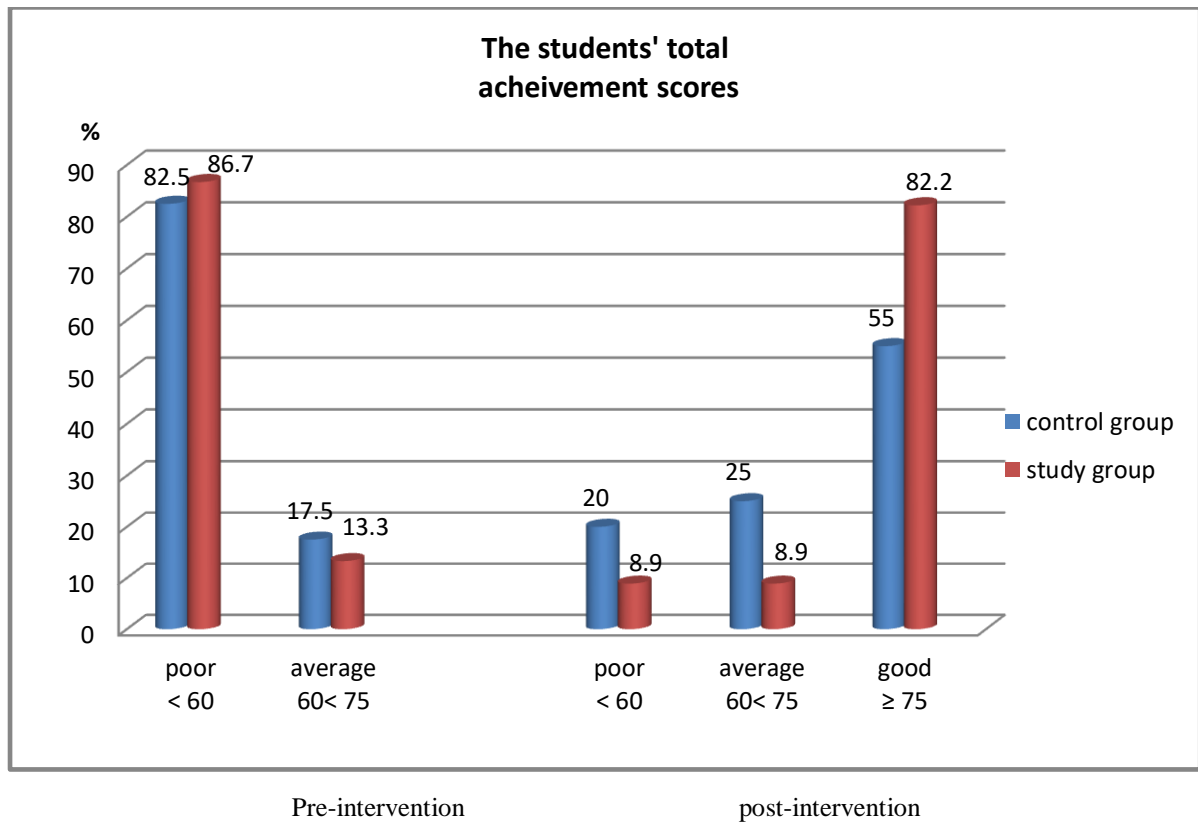
Figure 2: Distribution of the Students in Study & Control Groups in relation to their Total Achievement Scores (Pre/Post Intervention) (n=85).
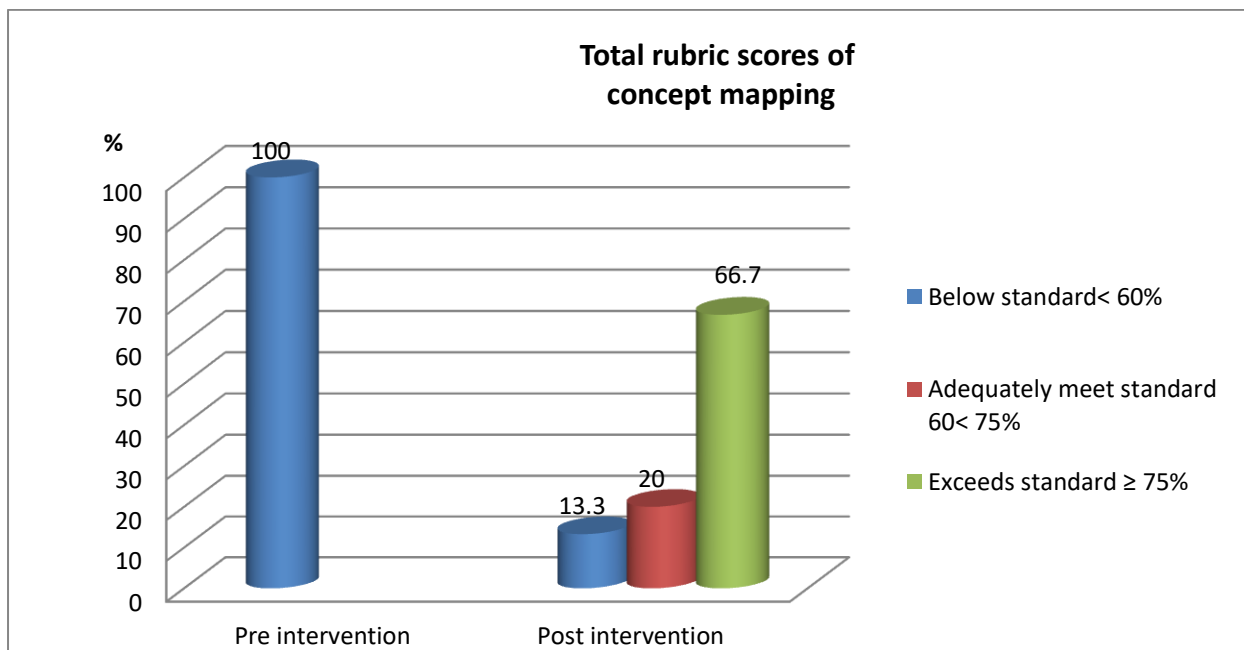

Figure 3: Distribution of the Students in the Study Group according to their Total Rubric Scores of Concept Mapping (Pre/ Post Intervention) (n=45).
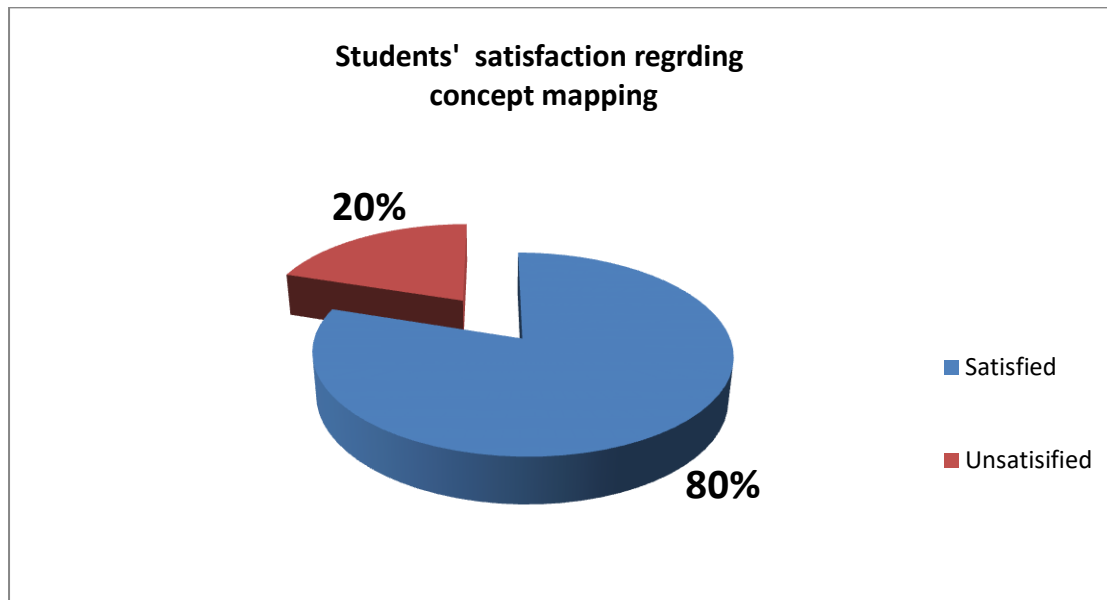
Figure 4: Distribution of the Students in the Study Group according to their Satisfaction regarding Concept Mapping (n=45).

Table 2: Correlation between the Total Concept Mapping Knowledge and Total Achievement Scores of the Students in the Study Group (Pre/Post Intervention) (n=45).

Item	Total achievement scores n= 45	
	r	p-value
Students' total knowledge regarding concept mapping (pre intervention)	0.192	0.2
Students' total knowledge regarding concept mapping (post intervention)	0.73	0.001**

Table 3: Correlation between Concept Mapping Skills and the Achievement Scores of the Students in the Study Group Post Intervention (n=45).

Item	Achievement scores (post intervention) n= 45	
	r	p- value
Students' concept mapping skills (Post intervention)	0.69	0.04*

4. DISCUSSION

Concerning the characteristics of the students in study and control groups (table, 1), the current study revealed that, the mean age of the study group was 21.31 ± 0.73 years and that of the control group was 21.25 ± 0.70 years. The females were in the majority for both groups, represented more than three quarters of students in study and control groups. In addition, the majority of the students had secondary school education as a previous qualification. These findings were supported with **Farrag, (2017)**, who studied "The effect of concept mapping strategy for improving maternity nursing students' achievement" and found that, the mean age of both groups was nearly equal, the mean age of the control group was 20.91

± 0.50 years and that of the study group was 19.88 ± 0.39 years. Also, added that, the percentage of students having secondary school certificate represented the majority in the control and study groups.

The current study findings goes in the same line with **Atay and Karabacak, (2012)**, who investigated "The effect of care plans using concept mapping on critical thinking dispositions of nursing students" and found that, females were 85% in the study subject. The researcher believed that the female students would prefer to be engaged in nursing studies as a female dominated profession more than the male students.

Concerning the knowledge of the students in the study group regarding concept mapping, the current study findings denoted that, most of the students in the study group had poor level of knowledge regarding concept mapping pre intervention. While, there was an improvement in the level of knowledge about concept mapping among the students post intervention. These findings were in an agreement with **Abd-Elwarth**, **(2016)**, who studied "The effectiveness of using concept maps to improve maternity nursing student achievement", and found that, there was highly statistical significance difference of the study group related to knowledge of concept mapping pre and post intervention. From the researcher point of view, this could be explained by the fact that, concept mapping is a new method that most of the nursing students did not have any previous experience about this method except after the intervention. Where, exposure to learning by using concept mapping strategy made the students gaining theoretical background about concept mapping.

The current study findings (figure, 2) revealed that, the majority of students in both study and control groups had poor level of knowledge regarding respiratory disorders pre intervention. Meanwhile, the students in the study group had higher achievement scores regarding to respiratory disorders knowledge than the students in the control group post intervention. The study findings were supported by **Batdi, (2014)**, who study "The effect of using the concept mapping technique and traditional methods on the achievement, retention and attitudes of students" and showed that, concept mapping improved students' learning and had a positive effect on their achievement and retention more than the traditional method.

As well as, the current study findings were supported with previous studies namely **Aghakhani et al., (2015), Kaddoura et al., (2016), Khrais and Saleh, (2017)**. All of these studies confirmed that concept mapping method significantly enhanced the students' learning in the cognitive domain more than lecture method. From the researcher point of view, concept mapping is a unique method that increases the students' ability to accommodate new information with pre-existing one in a meaningful way, which increases the student's understanding. However, in lecture method, the student is in-active and is just the recipient of information and does not perform any processing for information storage. Consequently, the information is not stored in a hierarchical (meaningful) way, which causes some problems in understanding and retention of information.

The current study findings (figure, 3), revealed that, all students in the study group were below standard level regarding concept mapping skills pre intervention. Then, the students were improved gradually in their concept mapping skills post intervention. These findings were in an agreement with **Daley et al., (2013),** who study "Concept maps: a strategy to teach and evaluate critical thinking" and stated that, the score of the study group's assignments regarding the concept mapping skills was improved from the first to the last assignment. From the researcher point of view, the students' improvement in concept mapping skills could be due to the continuous guidance, instructions and feedback provided by the researcher to the students in order to improve their construction of concept mapping. In addition, the simplicity and familiarity of the students with the process that came after several practice of concept mapping construction.

Concerning the students' opinion regarding concept mapping (figure, 4), the current study revealed that, most of the students in the study group had positive opinions regarding concept mapping and the students were satisfied with concept mapping as a new teaching strategy. These finding were supported by **Hamed and Sherif, (2015),** who study "Concept mapping to improve nursing students' performance in clinical area" and mentioned that, the majority of students reported favorable and positive attitude toward application of concept mapping and suggested using concept mapping in non-nursing courses. Also**, Jaafarpour et al., (2016),** Who conducted a study with title "Does concept mapping enhance learning outcome of nursing students" and found a highly level of satisfaction among the students regarding their learning experience and affective recognition of concept mapping. From the researcher point of view, these findings may be due to that, the students in the study group were interested in using the geometric forms to organize the lecture's information, which helped the students to think deeply and feel more motivated.

The current study findings (table, 2), revealed a significant correlation between the total concept mapping knowledge and the total achievement scores among the study group post intervention. These findings were in an agreement with **Attia, et al (2019),** who study "Effect of apply concept map on students' perception to antenatal unit" and reported a significant correlation between the achievement test scores of the students and their concept mapping scores.

The researcher emphasized that, concept mapping strategy could improves the ability of the students to organize and manage the knowledge by encouraging students to process information deeply for understanding and so, concept mapping, assists the students reaching higher levels of cognitive learning rather than memorizing a series of concepts. However, The study findings were inconsistent with other studies as **Van Bon-Martens, et al., (2014)** who conducted a study with a title "Concept mapping as a promising method to bring practice in to science" reported that, concept mapping had no significant impact on students' progress of knowledge and practice.

The current study findings (table, 3)**,** revealed a significant correlation between concept mapping skills and the achievement scores of students in the study group post intervention. These findings were in an agreement with **Farrag, (2017)**, who concluded that, students' abilities to construct knowledge by concept mapping were significantly enhanced their academic achievements by the end of the courses. The researcher believed that, using of concept mapping to outline lecture content, were assisted the students to better learn course content and increase the students ability to understand massive amount of knowledge and promote critical thinking.

5. CONCLUSION

In the light of the current study findings, it can be concluded that, mapping skill intervention improved the nursing students' achievements in pediatric nursing course compared with the traditional nursing education. Where the students in the study group achieved higher scores of knowledge in pediatric nursing than the students in the control group. As well as, most of students in the study group were satisfied and perceived concept mapping positively as a learning tool.

6. RECOMMENDATIONS

In the light of the findings of the current study the following recommendations are suggested:

1. Training for the nursing students to acquire concept mapping skills as a learning strategy in their education.

2. Integrate concept mapping strategy as a method of teaching in pediatric nursing course.

3. Shed light on the obstacles hindering the implementation of the concept mapping method in pediatric nursing education.

4. Further researches involving larger sample are recommended to ensure generalization of the results.

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