Effect of Using Mind Mapping Learning Technique among Undergraduate Nursing Students

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Abstract

Background: Through the use of a variety of instructional techniques, students in nursing education must be prepared for lifelong and self-directed learning. Therefore, it is crucial to use such creative teaching methods that foster learning by guaranteeing memory of information so that one may recall it and encouraging critical thought, such as the Mind Mapping Learning Technique, which is one of these creative learning methods. **Aim**: To determine the effect of using mind-mapping learning techniques among undergraduate nursing students. **Subjects and method: Design**: A quasi-experimental research design pre- posttest and control group was used to achieve the aim of the current study. **Setting**: the study was carried out in the Faculty of Nursing affiliated to El-Mansoura University. **Subjects**: The study included 1000 newly entry students at first year at B.Sc. level. Nursing students who were selected through a non-probability convenient sampling technique divided equally into experimental and control group each include 500 students from the above-mentioned study setting. **Tools**: Two tools were used for data collection: **Tool (I):** A close-ended self- administering questionnaire, it administered to both groups pre- and post the intervention to assess personal data. **Tool (II):** Undergraduate nursing students' perception of mind mapping learning technique, it also administered to the experimental groups pre/post the intervention. **Results**: The results revealed no statistically significant difference between the pass rates of the control group (48.4%) and the intervention group (51%) pre the intervention. While post the intervention, the experimental group's pass rate increased to 92% while the control group was 52% with (p <0.001). In comparing between both groups, the control group showed better performance with (p< 0.001). The experimental group showed very high perception of the mind-mapping approach as well they were strongly connected to gains their scores with (r=0.619, p<0.01). **Conclusion**: The current study concluded that the mind-mapping learning methodology is superior than the other currently used study methods and that successfully help students in learning subjects by overcoming issues with retention and recall. **Recommendations**: The study suggested that the mind-mapping learning technique should be implemented as an effective and acceptable teaching technique for nursing students' education.

Keywords: Mind mapping learning technique, Undergraduate nursing students

Introduction:

In nursing across the globe, there have been changes to educational programmes and teaching methods designed to increase students' responsibility for their own learning and active participation, with a greater tendency toward self-directed learning to ensure lifelong continuing education. These modifications resulted from educators' worries that pupils frequently memorise data through "rote learning" rather than comprehend and apply ideas from "meaningful learning." (**Buzan and**

Buzan, 2010). Techniques including note-taking, brainstorming, assessing students' organisational skills, learning together, presenting, and researching are all incorporated into problem-based learning. Additionally, the relevance of critical thinking in nursing education is rising (Spencer et al., 2019). Additionally, a variety of instructional techniques have been discovered for use during the nursing education process (Julie et al., 2018). Such creative methods would enhance students' capacity to create nurse care plans, engage in health promotion activities, analyse

illness processes, and make differentiating nursing diagnoses (Rosciano, 2015). However, this calls for interactive teaching and learning techniques, which would present a new obstacle for nurse educators (**Zipp and Maher, 2019).**

In order to help students think and learn more effectively, nurse educators should design learning experiences. The innovative learning technique of mind mapping offers pupils a fresh setting in which to process material and may assist increase memory recall. Early in the 1980s, a method for helping pupils organize their thoughts by mentally mapping words or ideas in order to clarify them was developed (**Daley et al, 2016**).

A mind map can be defined as a diagrammatic representation of words, concepts, tasks, or other elements connected to a study topic organized around a primary term or concept (**Ambrose et al., 2018**). The core subject of the study is depicted in the middle, with keywords relating to subtopics branching out in an erratic pattern. A technique of gradually branching smaller branches out from the subtopics and adding more information about the issue is used. In order to encourage greater creativity and enjoyment while learning, artistic arrangements are not only acceptable but also necessary (**Jones et al., 2018**).

The field of nursing is rapidly expanding and has a broad curriculum. In their courses, nursing students must learn a vast amount of material. As a result, pupils could learn by rote rather than developing their critical thinking skills. Nursing education reforms today show the importance of preparing students for lifelong, independent learning (Ambrose et al., 2018).

One active learning technique known as mind mapping helps pupils use their natural thinking skills and memory retention (**Eshwar et al., 2016**). Using pictures to represent knowledge instead of written sentences is a basic approach called mind mapping. By positioning the main theme in the center and positioning the related sub-themes around it, the mind mapping approach enables students to organize the material (**Atia et al., 2017).**

Mind maps are seen to be effective metacognitive tools that can help people learn in meaningful ways, which makes them useful for fostering and assessing critical thinking (**Edwards and Cooper, 2020**). In order to have a deeper grasp of the many courses, students link together known and unknown information using mind maps (Kyoko and Hiroko, 2019). It is a very efficient way to take notes, and it facilitates the recollection of prior memories. Instead of instructing pupils to think, this teaching-learning approach enables them to actively gain knowledge. Through patterns, words, or symbols, it encourages kids to connect tales (**Mento et al., 2019**).

Additionally, mind mapping can be utilised for self-learning since it promotes inquiry and reflection, integrates concepts, makes it easier to obtain a conceptual comprehension of a large quantity of material, and fills the gap between theory and clinical competence. It can also be included in problem-based learning (**Thomas et al, 2016**). As it recently used in the conduction of systematic reviews (**Pombo et al, 2017**) and biomedical research as well (**Jiang et al, 2016**) with related software programs (**Mammen, 2016; Wilson et al, 2016**).

Significance of the study:

The pressure to produce graduates who can think critically and solve problems in a range of clinical practice contexts is on nurse educators. Instead of depending on conventional teaching techniques that encourage memorization and recall, they need active teaching practices that encourage meaningful learning. Concept mapping is an example of a teaching-learning strategy that could help nurse educators prepare students to think critically in the complicated healthcare setting.

Mind mapping has been widely accepted as a useful learning method for studying, condensing, remembering, and recalling information in a variety of scientific fields. The evidence on the use of mind mapping as a learning strategy in nursing education is, however, sparse, according to the literature on nursing. Determining the impact of mind-mapping learning strategies among undergraduate nursing students was the researcher's primary goal.

Aim of the study:

The study aimed to determine the effect of using mind-mapping learning techniques among undergraduate nursing students

Research hypothesis:

Application of mind mapping technique expected to improve learning process among undergraduate nursing students with better success rates**.**

Subjects and method:

Research design:

A quasi-experimental research design pre-post-test with control group was used to achieve the aim of the current study

Settings:

The study was carried out in the Faculty of Nursing affiliated with to El-Mansoura University.

Sample:

The study included 1000 newly entry first-year students at B.Sc. level. Nursing students who were selected through a non-probability convenient sampling technique was equally divided into an experimental and a control group including 500 undergraduate nursing students in each group from the above-mentioned study setting.

Tools for data collection:

Tools: Two tools were used for data collection:

Tool (I): A close-ended self- administering questionnaire w a s administered to both groups pre- and post-the intervention. It was developed by the researchers after reviewing the related national and international literatures (**Annemarie, 2015; Wilson et al, 2016, Pombo et al, 2017; Oluwatosin and Bello, 2018**; **Adodo, 2019**). This tool consisted of two parts as the following:

Part 1: This part included information about undergraduate nursing students as age and gender.

Part 2: A written test with 20 multiple-choice questions about the topics covered in class was included in this section. Both groups were subjected to the test twice: once before the intervention and once again after the intervention. A score of two was given for the right answer and a score of 0 for the wrong one. The overall pain rating was (40). When the student's score exceeded

80%, they were passed; when it fell below 80%, they were failed.

Tool (II): perceptions of the intervention group's undergraduate nursing students towards the pre- and post-intervention mind mapping learning approach. The researchers created it after studying relevant national and international literatures (**Oluwatosin, 2018; Adodo, 2019**). With the help of this instrument, intervention students' perceptions of mind maps as a learning tool were to be evaluated. Ten statements—five positive and five negative—were included. The replies were given on a 5-point Likert scale, with "strongly agree" being the most common response. Accordingly, these received scores ranging from five to one. For negative assertions, the scoring was inverted so that a higher score denotes greater agreement with the statement. In order to calculate a mean score with a maximum of five, the 10 items' scores were added up and divided by the number of statements.

Validity of the tools

The content validity of the research tools were evaluated for clarity, comprehensiveness, appropriateness, and relevance by a board of five professional professors with more than ten years of experience in administration and community health nursing. The board verified the legitimacy of the tools' appearance and content.

Reliability of the tools

Reliability was assessed through using Cronbach's alpha reliability test. The reliability of the perception scale was assessed by testing its internal consistency. It showed reliability with a Cronbach alpha coefficient of 0.86, i.e. higher than the acceptable level of ≥0.70 according to *(Kirk and Miller, 1986)*.

Administrative and ethical considerations:

Official approval to conduct the study was received by the Mansoura University research ethical committee and through a letter issued by the Dean of the Faculty of Nursing, Mansoura University. The researcher explained

to the students that participation in the study is optional and that they have the freedom to discontinue at any moment, without providing a reason, before starting data collecting. Nursing students at the undergraduate level provided their verbal consent. Additionally, they were informed that their data would be kept private and only used for study.

A pilot study

After the tool was created, a pilot study involving 10% of the sample was conducted (100 undergraduate nursing students). It was done to look for tool ambiguity, confirm item transparency, and determine how long it would take to collect the data. The final form of the tools was developed using the findings from the pilot study, which also clarified and tested the feasibility of the research methodology. The pilot research's undergraduate nursing participants were also included in the study.

Fieldwork:

The researchers began meeting with undergraduate nursing students to explain the purpose of the study, its protocols, and invite them to participate after receiving official approvals to carry out the study. Those who gave their assent were split into two equally sized, gender- and age-matched groups, one for the intervention group and the other for the control group.

The intervention group was divided into small subgroups of 50 students each. The educational guidelines were presented in theoretical and practical sessions. Each subgroup got four sessions, two theoretical and two practical. The theoretical session's time was from (45-60 minutes each) including lectures using data show and group discussions covered the basic concepts, methodology, advantages, and applications of the mind mapping learning methods. They were also informed about the principles of how to use mind mapping by drawing the topic in the center with keywords branching out in a divergent pattern; the keywords corresponding to subtopics. Then, smaller branches project from the subtopics with further details regarding the subject. The practical part was conducted in two sessions, one-hour each using demonstration-re-demonstration. They

involved hands-on training in producing mind maps for selected topics. Four topics were selected as study materials, namely diabetes, hypertension, renal failure, and pneumonia. During the training, participants were allowed to ask questions regarding the technique and its application. Students were informed to be in contact with the researchers by telephone for any guidance.

The student control group was given the same chosen topics and the same study period using the standard teaching methodology. The same evaluation form and technique were used to evaluate undergraduate nursing students in both groups at the conclusion of the course. 20 multiple-choice questions were included in a written test for this. It took 60 minutes to complete the test. In accordance with Bloom's taxonomy, questions showed a range of cognitive abilities. The results of the two groups' undergraduate nursing students' test scores were compared. Additionally, utilizing the pre-designed measure, the intervention group was able to learn how undergraduate nursing students perceived the novel mind map technique. The work lasted for two months.

Statistical analysis:

SPSS 20.0 was used as the statistical software tool for data entry and analysis. The non-parametric Mann-Whitney test was used to compare quantitative continuous data. Chi-square or Fisher exact tests, as appropriate, were used to compare qualitative categorical variables. The study of the interactions between ranked and quantitative variables using Spearman rank correlation. Multiple linear regression analysis and an analysis of variance for the complete regression models were performed to determine the independent determinants of the knowledge score. A p-value of 0.05 was used to determine statistical significance.

Results:

According to Table 1, in the intervention group, 60% of the undergraduate nursing students were female, as opposed to 56% in the control group. Similar median ages of 18.0 years were found in the two groups.

Table (2) shows that there was no statistically significant difference in the pass

rates of the control and intervention groups prior to the intervention (48.4% vs. 51.0%). In the post-intervention phase, there was a statistically significant difference between the success (pass) rates for the intervention group (92.0%) and the control group (52%) (p<0.001).

Table 3 shows very high agreement for all affirmative statements on the intervention group's perception of the mind mapping learning approach among the undergraduate nursing students who were the subject of the study. This varied from 79% for aiding in memory to 90% for enhancing comprehension of issues. However, the table revealed only a very small percentage of respondents (2%) who agreed with the negative phrases "Not my way of learning" and "I don't think it helped with retention of material."

Table 4 shows statistically substantial positive correlations between the post-pre-intervention scores of the undergraduate nursing students under study (which indicate improvement) and their scores of agreement with respect to a number of beneficial characteristics of the mind-mapping learning technique. The statement that said it was useful when learning concepts had a weaker association (r=0.0658) than the statement that indicated it helped recall facts. The table, on the other hand, shows statistically significant weak to moderate negative correlations between the scores of the agreement on the two negative statements. There was an overall moderately positive association between students' total post-pre-intervention scores and their total scores of agreement with various beneficial components of the mind mapping approach (r=0.619).

Table 1: Frequency and percentage distribution of the studied students regarding their characteristics data among the study and control groups

	Group				X^2 test	p-value
	Intervention (n=500)		**Control (n=500)**			
	No.	**%**	**No.**	**%**		
Gender:					0.00	1.00
Male	200	40.0	220	44.0		
Female	300	60.0	280	56.0		
Age: Mean±SD	18.3±0.6		18.4±0.3		1.48	0.22

(U) Mann-Whitney test

Table 2: Scores and Written test results among studied undergraduate nursing students among the study and control groups

	Group				X^2 test	p-value
	Intervention (n=100)		**Control (n=100)**			
	No.	**%**	**No.**	**%**		
Pre-score:						
Pass (80+)	255	51.0	242	48.4		
Fail (<80)	245	49.0	258	51.6	1.59	0.23
Mean±SD	68.2±8.1		65.6±8.2		3.54	0.07
Post-score:						
Pass (80+)	460	92.0	260	52.0		
Fail (<80)	40	8.0	240	48.0	26.97	<0.001*
Mean±SD	85.2±8.4		72.6±5.8		86.93	<0.001*

(*) Statistically significant at p<0.05   *(U) Mann-Whitney test*

Table 3: Perception of the studied undergraduate nursing students among the intervention group regarding mind mapping learning technique

Items	Perception (%)			Score	
	Strong agree/ Agree	Uncertain n	Strong disagree/ disagree	Mean	SD
Valuable when learning Concepts	86.0	14.0	0.0	4.06	0.57
Improving understanding of Topics	90.0	9.0	1.0	4.14	0.68
Helpful in recalling information	79.0	20.0	1.0	4.33	0.89
Helpful in organizing Information	82.0	10.0	8.0	4.07	0.67
Encouraged us to read & outline the chapters	84.0	9.0	7.0	4.13	1.03
Helped to clear my concepts	83.0	10.0	7.0	4.17	0.89
Good self-study tool	84.0	8.0	8.0	4.14	1.06
Helpful for rapid revision	83.0	12.0	5.0	4.16	1.05
Enjoyed learning nursing with this method	82.0	11.0	7.0	4.13	1.02
Not my style of learning	2.0	14.0	84.0	1.80	0.83
I don't think it helped with retention of material	3.0	17.0	82.0	1.91	0.84
Total perception	90.0	3.0	7.0	3.73	0.58

Table 4: Correlation between perception of the intervention group regarding mind mapping learning intervention technique and the differences between their pre-posttest scores

Items	Post-pre-intervention scores	
	Spearman's rank correlation coefficient	p-value
Valuable when learning concepts	0.352	0.001**
Improving understanding of topics	0.386	<0.001**
Helpful in recalling information	0.658	<0.001**
Helpful in organizing information	0.487	<0.001**
Encouraged us to read & outline the chapters	0.586	<0.001**
Helped to clear my concepts	0.579	<0.001**
Good self-study tool	0.573	<0.001**
Helpful for rapid revision	0.582	<0.001**
Enjoyed learning nursing with this method	0.583	<0.001**
Not my style of learning	-0.434	<0.001**
I don't think it helped with the retention of material	-0.323	0.001**
Total perception	**0.619**	**<0.001****

(**) Statistically significant at $p<0.01$

Discussion:

Students build relationships between unfamiliar and known knowledge using mind maps, which improves comprehension. It is a very effective way to take notes and facilitates the recall of older memories. Instead of instructing students in critical thinking, this approach to teaching and learning supports their active knowledge acquisition. Mind mapping depicts the nurse's interpretation and integration of information because there is no template or flow chart to drive the nurse's thinking, leading to meaningful learning (**Wilson and Chris, 2019**).

According to the study's findings, the median age of the two groups was about the same. The two groups' basic characteristics, such as age and sex, were matched for and

similar from the researchers' perspective, and there was no statistically significant difference between them. For a fair comparison of the control group and the intervention group, this group similarity was crucial.

The current study's findings showed that, while there was no statistically significant difference between the two groups' posttest scores before and after the intervention, about half of the undergraduate nursing students in the control group had a slightly lower pass rate than the intervention group before the intervention. This, in the opinion of the researchers, demonstrated the advantages of utilizing the mind mapping method in nursing education. The results of the current study thus supported the use of mind mapping in teaching.

Furthermore, the results of this study are in line with those of **D'Antoni, et al. (2019)**, who discovered that mind mapping is an effective method for helping medical students retain new information and retrieve short-term memory. These results are similar to those of a study by **Kaddoura et al. (2019)** in North Carolina titled "Impact of a concept map teaching approach on nursing students' critical thinking skills," which discovered that first-year nursing students in the Bachelor of Nursing program who were taught by a mind mapping group had significantly better posttest results than their peers who were taught by the traditional methods.

Similar to this, **Jaafarpour et al. (2019)** assessed the efficacy of concept mapping as a teaching method for nursing students in a quasi-experimental study in Iran, and their findings indicated that the use of mind mapping was based on their significantly higher post-test scores compared with the conventional methods group. Furthermore, during the course of the intervention's eight sessions, their ratings gradually improved.

The results of the current study are in line with a study done by **Rooda (2019)** to determine whether mind mapping is a useful learning approach for baccalaureate-level students taking an introductory nursing research course. According to the findings, pupils who employed mind mapping techniques performed better on exams than those who did not. The study concluded that students who used mind mapping were able to attain and recall a large volume of complex data.

In addition, **Zadeh et al. (2020)** conducted a quasi-experimental study among Iranian nursing students to compare the effectiveness of mind mapping to the conventional methods and found no differences between the pretests of the two groups. While pupils in the mind mapping group scored much better on the posttest than those in the control group. Additionally, a study conducted in the United States by **Bixler et al. (2018)** titled "Collaborative concept mapping and critical thinking in fourth-year medical students" clarified the evidence of mind mapping effectiveness in improving students' knowledge and practice as well as in enhancing their critical thinking disposition and skills.

Additionally, **Yue et al. (2017)** validated the benefit of mind mapping in fostering critical thinking in nursing education in a systematic study titled "The usefulness of idea mapping on the development of critical thinking in nursing education."

The results of the current study among the intervention group showed that the perception of the undergraduate nursing students toward the mind mapping learning technique was very highly agreed upon all positive statements with improvement in the students' level of knowledge which documented by result of the post-test scores.

The results demonstrate the beneficial impact of mind-mapping learning methods at all levels of cognition.

This outcome is consistent with a study undertaken by **Duffy et al. in (2019)** with the working title "Experiences of utilising Prezi in psychiatry education." in Ireland and found that most of the students using mind mapping viewed the technique as helpful, stimulating, and interesting.

Similarly, Grice (2016) reported that nursing students who used mind mapping as a learning tool found the process of creating such maps valuable to their learning and that they enjoyed it. Grice's study focused on "Concept Mapping as a Learning Tool in Occupational Therapy Education" and was conducted in the United States.

Regarding correlations between the post-pre-intervention scores of the studied undergraduate nursing students and their scores of agreement with various positive aspects of the mind mapping learning technique, the current study's findings revealed that there were statistically significant positive correlations between the post-pre-intervention scores of the studied undergraduate nursing students and those scores. According to the researcher, it shows improvement in the undergraduate nursing students' mind mapping learning after the intervention.

These results are consistent with a study by **Jones et al., (2018**) titled "The impact of mind mapping activities on students' motivation," which highlighted the ability of students to comprehend information with an improvement in grade values.

The results of the current study showed that the mind mapping learning group's undergraduate nursing students had greater success rates and, numerically, considerably higher post-pre score deference. As a result, using mind maps to teach appears to be more effective than using traditional methods. This is explained by its inherent properties of encouraging the brain's synergistic activity by utilizing codes and visuals with a variety of colors and dimensions to enhance the topic's important elements, which subsequently improves recall ability (**Spencer et al, 2019**).

These results are consistent with those of **Atia et al. (2017),** who investigated the "Effectiveness of Mind Maps as a Learning Tool for Nursing Students" and found that, because it is well-liked by students, mind mapping is a useful and effective educational technique that could aid nursing students in learning nursing lessons. To increase students' capacity for learning, nursing schools should implement this straightforward method, which only requires a brief training in its application. Due of this, nursing educators may need to receive training on how to use Mind Maps as a Learning Tool with nursing students. The results of the study show that using mind mapping as a learning tool can assist undergraduate nursing students retain information more efficiently and creatively as a teaching-learning strategy to help the students to attain and recall a large volume of information during their course of study (**Sikha et al., 2018).**

Conclusion:

The current study indicated that, based on its findings, the mind-mapping learning methodology is effective than other popular study techniques and helps students to learn and understand subjects more deeply through overcoming problems with retention and recall.

Recommendations:

In light of the findings of the study, the following recommendations are suggested that:

- The mind-mapping learning technique should be implemented as an effective and acceptable teaching technique for nursing students' education.

- Further studies and replication of the present study with another sample of students in different settings are required for results generalizing.

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