Effect of Thinking Maps versus Traditional Lectures on the Academic Self-Efficacy, Achievement, and Satisfaction of Undergraduate Maternity Nursing Students

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Abstract

Background: The enhancement of critical and creative thinking denotes an essential objective of higher educational institutions. Creative thinking inquiries by students may be integrated with thinking maps. **Aim**: To investigate the effects of thinking maps versus traditional lectures on the academic self-efficacy, achievement, and satisfaction of undergraduate maternity nursing students. **Design**: A randomized controlled trial was performed on 176 students registered in maternity and gynecological nursing course at the Faculty of Nursing in Mansoura University, Egypt. **Sampling**: A simple random sample was utilized. Participating students were randomly assigned into two equal groups, with eighty-eight students in each group. The intervention group was instructed through thinking maps, and the control group was taught via traditional lectures. **Results**: The group instructed through thinking maps exhibited a higher level of academic self-efficacy, a higher academic achievement score, and more satisfaction than the traditional lecture group. The statistical differences between the groups were highly significant. **Conclusion:** The study hypotheses were accepted, indicating that thinking maps are effective as teaching strategies and exert significant positive effects on the academic self-efficacy, achievement, and satisfaction experienced by undergraduate maternity nursing students. This study **recommended** that thinking maps should be applied in other educational courses to enhance the self-efficacy, academic achievement, and satisfaction of students.

Keywords: Academic Achievement, Self-Efficacy, Student Satisfaction, Traditional lectures, Thinking Maps.

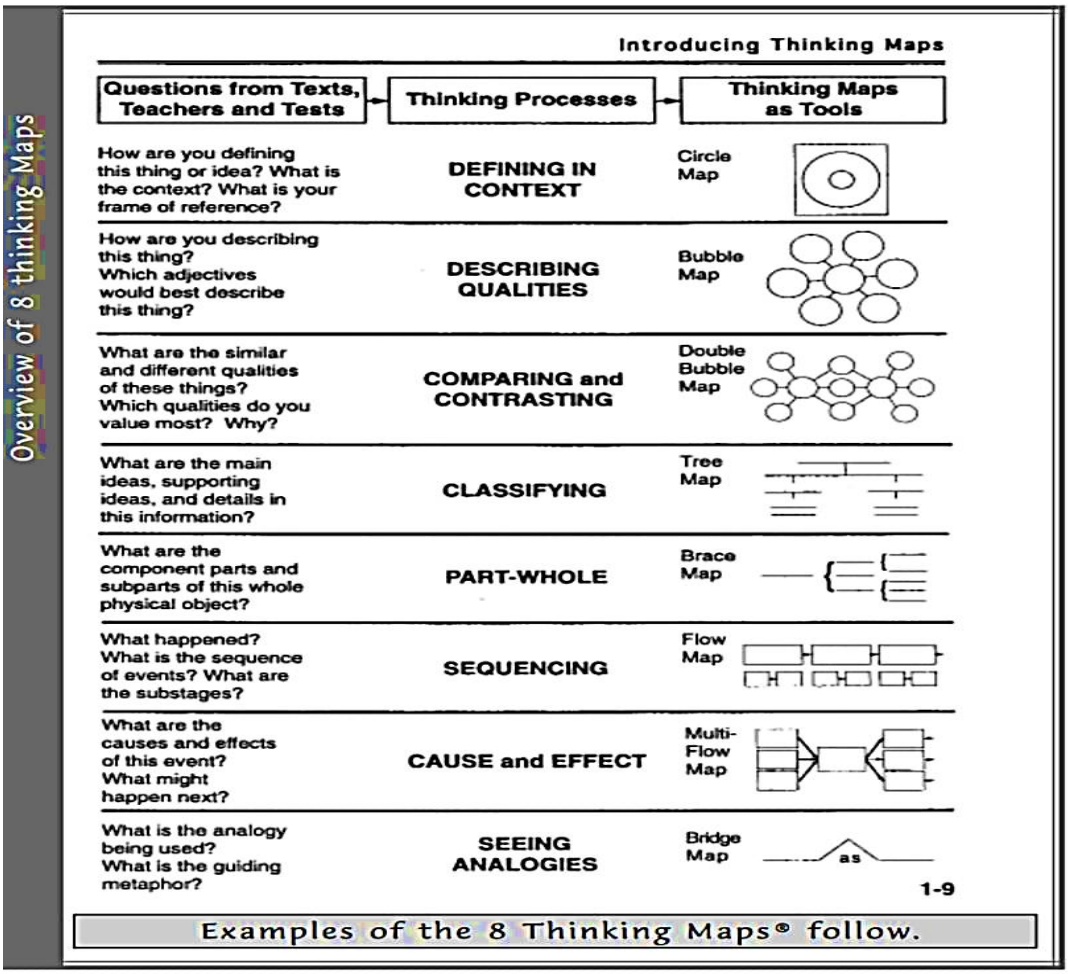
Introduction

Thinking maps are visual tools used in education and include a set of eight graphic organization techniques each linked to a specific cognitive process. The use of this method can help all students achieve higher levels of critical and creative thinking. The thinking maps represent the language of the cognitive process pattern and allow teachers to elucidate their clinical reasoning **(Haviz, 2020)**. They also help learners to remember key points and quickly review information. In addition, these aids make teaching points more accessible to learners by positioning them in visually interesting ways and emphasizing only keywords **(Gossack &Keenan, De Wit, Gardiner, Turcotte, & Chan, 2020)**.

Thinking maps motivate learners to move, interact, and access their semantic and episodic memories to strengthen connections. They support all learning styles. In addition, thinking maps can serve as tools for the formative and summative assessment of student progress while simultaneously lending them to differentiation and supporting critical thinking skills in students. Thinking maps allow the accurate tracking of student performance over time and accord students with lifelong thinking tools that can benefit them in their personal, academic, and professional careers **(Schmehl, 2014)**.

Thinking maps can take many forms, each of which may be utilized to portray a single thinking process. Maps may be shaped as circles, bubbles, double bubbles, trees, flows, multi-flows, braces, or bridges. Circle maps are

used for definitions or concept clarifications and present points of view about a general topic. Bubble maps can describe emotional, sensory, and logical qualities. Double bubble may be deployed to compare or contrast qualities, while tree maps can reveal the relationships between the principal ideas and their supporting details. Flow maps present events as a sequence, while multi-flow maps display causes and effects that can help predict outcomes. Brace maps exhibit physical structures and part-whole relationships. Finally, bridge maps convey transfer or form analogies and metaphors **(Jackson, 2015; Sönmez, Akkaş, &Memiş, 2020)**. *An Overview of Thinking Maps (Fig.1).*



An Overview of Thinking Maps (Fig.1)

Winfield & Melissa, (2012). An Overview of Thinking Maps [PowerPoint slides]. Retrieved from http://www.slideshare.net/mwinfield1/an-overview-of thinkingmaps?utm_source=slideshow01&utm_medium=ssemail&utm_campaign=share_slideshow_loggedout

For nursing students, a high academic performance marks the first step to professional success. The recruitment of new creative graduate nursing students would enable the identification of varied health problems in patients as they emerge **(Burbach et al., 2015; Blakeslee, 2020)**. Critical thinking is essential for the delivery of safe, effective, competent, creative, and critical care and the enhancement of patient outcomes **(Adib-Hajbaghery & Sharifi, 2017; Carvalho et al., 2017; Jones, 2017; Von Collin-Appling & Giuliano, 2017; Kim, 2018)**.

Creativity is a human intellectual function that signifies the generation of a novel and original artifact, idea, or innovation and can also facilitate the re-elaboration and amelioration of existing products or ideas. Creative thinking is defined as the mental process pertaining to the active and skillful perception, analysis, synthesis, and evaluation of collected information through observation, experience, and communication, leading to a decision toward an action **(Kim, Honga, Kang, Brandt, & Kim, 2020)**.

Critical thinking is widely accepted as a fundamental skill in nursing education, and its importance and practice are globally acknowledged **(Kim et al., 2020)**. This ability can be developed and amplified during classroom exercises and clinical assignments **(Papathanasiou, Kleisiaris, Fradelos, Kakou, & Kourkouta, 2014)**. Put differently, the clinical practice provides nursing students with opportunities to think critically, apply information from theory classes, and reflect on their care experiences. Consequently, students can develop their critical thinking abilities, reinforce self-knowledge, strengthen coping capacities, and enhance their clinical practice **(Kim et al., 2020)**.

Academic self-efficacy, success, and satisfaction represent three important factors of learning **(Hassankhani, Aghdam, Rahmani, & Mohammad poorfard, 2015)**. Academic self-efficacy affects scholarly success and satisfaction. Psychologist **Albert Bandura (1982)** originally defined the concept of self-efficacy and described it as the personal judgment of how well one can execute courses of action required to deal with prospective situations. Academic self-efficacy denotes the belief of students in their abilities to attain the planned educational achievements and their judgment of their capabilities of organizing and executing the courses of action required to attain the desired levels of performance **(Sarıkoc & Oksuz, 2017)**.

Operational Definitions:

- ***Academic self-efficacy*** represents the confidence a student perceives in creatively performing a given task in a specific course **(Karwowski & Kaufman, 2017)**.
- ***Academic achievement*** describes the development level student attains under the guidance of a teacher in the course of learning conducted over a defined period based on the credit hour policy **(Tian & Sun, 2018)**.
- ***Student satisfaction*** denotes a student's attitude toward the learning method experienced through the educational experience of attending study course **(Weerasinghe & Fernando, 2017)**.

Significance of the Study

Modern medical environment requires nurses to attain the abilities of independent judgment, independent decision-making, and autonomous execution in their clinical practice. Hence, nursing staff must be equipped with critical thinking skills **(Wu & Wu, 2020)**. Globally, the development of creative and critical thinking is considered an educational challenge for higher education, especially for nursing students who must handle patients. The traditional lecture -based teaching methods represent the passive style of learning and do not enable the development of creative or critical thinking skills in students. Critical thinking and creativity are required for the reinforcement of the professional preparedness of nursing students to help them identify discrete potential problems in clinical situations **(Papathanasiou et al., 2014)**.

Critical thinking is a key skill for nurses because it enables them to perform safe, effective, and skillful care **(Sharifi, Arbabshastan, Arbabisarjou, & Safabakhsh, 2016)**. It is also been revealed that, mind mapping is a cognitive training tool that enhances learning efficiency and increases

learning motivation and interest **(Kotcherlakota, Zimmerman, & Berger, 2013)**. Academic self-efficacy is a creative thinking aptitude representing one of the most important indicators of academic success. It also forms the chief gateway for professional success **(Sarıkoc & Oksuz, 2017)**. Numerous extant studies have focused on academic motivation by applying new learning strategies to enhance the academic self-efficacy, achievement, and satisfaction of university students, but only a few such investigations have focused on nursing students **(Akomolafe, Ogunmakin & Fasooto, 2013; Alemdağ, Öncü&Yılmaz, 2014)**.

The Study Aim

The present study was conducted to investigate the effects of thinking maps versus traditional lectures on the academic self-efficacy, achievement, and satisfaction of undergraduate maternity nursing students.

The Study Hypotheses

Three hypotheses were tested to achieve the study aim:

- ***Hypothesis I:*** Undergraduate maternity nursing students instructed through thinking maps exhibit a higher level of academic self-efficacy than those taught through traditional lectures.
- ***Hypothesis II:*** Undergraduate maternity nursing students instructed through thinking maps exhibit higher academic achievement than those taught through traditional lectures.
- ***Hypothesis III:*** Undergraduate maternity nursing students instructed through thinking maps are more satisfied about their learning method than those taught through traditional lectures.

Subjects and Method

Research Design

The present study employed randomized controlled trial (RCT); RCT is often considering the golden standard for assessing effect of new intervention. The subjects are randomly assigned to receive an intervention or to be in control group. The effect of the intervention can be assessed be comparing the outcomes for both groups. The intervention group was instructed through thinking maps, while the control group received instruction through traditional lectures.

Study Setting

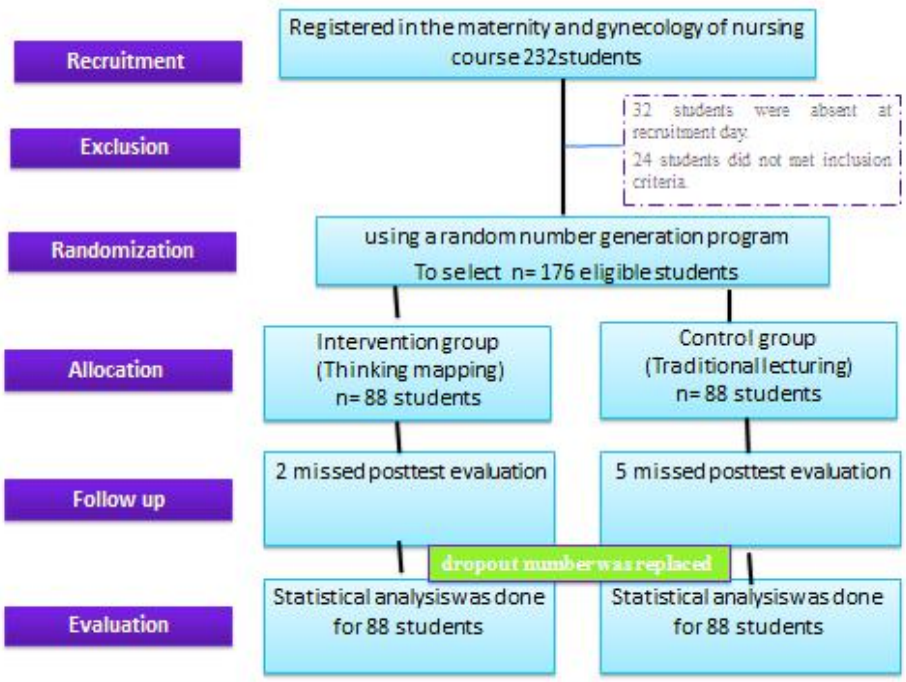
The present study was conducted in hall A, assigned for the Maternal and Gynecological Nursing course at the Faculty of Nursing in Mansoura University in Egypt.

Sampling

The present study was conducted during the first semester of the academic year 2019–2020. The sampling was performed on the population of credit hours students who were registered in the Maternal and Gynecological Nursing course. Students were eligible to enroll in this trial if they met the following criteria: they were first-time registrants to the Maternal and Gynecological Nursing course and did not possess theoretical knowledge of thinking maps before their enrollment.

Group Allocation

All students registered to the Maternal and Gynecological Nursing course during the study period were invited to participate in the present study. Of the total number of 232 registered students, 32 students were absent on the recruitment day, 24 students did not meet the inclusion criteria and were thus excluded from participation. Hence, 176 eligible students were recruited. The required sample was randomly selected from the list of student names and was divided into two equal groups (i.e., 88 students per each). The odd numbers were designated to the control group (traditional lectures), and the even numbers were allocated to the intervention group (thinking maps). Five students from the traditional lectures group (control group) did not attend the post-test evaluation, and two students from the thinking maps group (intervention group) missed the post-test evaluation. The dropout number was replaced, and the statistical analysis was accomplished with 176 students. *The flow- chart of the participants is illustrated below (Fig.2).*



(Fig.2) Flow-chart of the study

Data Collection Tools

Four tools were used for data collection: a self-administered questionnaire for students, a self-efficacy determination questionnaire, a structured questionnaire on knowledge achievement, and a student satisfaction score questionnaire.

I. Self-administered Questionnaire

This instrument was developed by the researchers to collect the general characteristics of the study participants. The questionnaire included four variables: age, gender, residence, and the average number of hours the students spent studying each day.

II. Self-efficacy Determination Questionnaire

The questionnaire to determine self-efficacy was adapted from a previous study **(Gaumer Erickson & Noonan, 2018)**. It consisted of thirteen items to measure the students' perceived level of proficiency in the two essential components of self-efficacy. The first element concerned the belief that ability could ameliorate with effort and comprised eight items. The second feature entailed the belief that the student was capable of meeting specific goals or expectations and included the remaining five items. The scoring system was based on a five-point Likert scale in which 0 indicated strongly disagree, 1 disagree, 2 neutral, 3 agree, and 4 strongly agree. The overall self-efficacy level was deemed high if the total score exceeded 75%; it was considered moderate if the total score ranged from above 50% to 75%; it was thought to be low if the total score was equal to or less than 50%.

III. Academic Achievement Questionnaire

The researchers designed an academic achievement questionnaire based on the taught lecture topic (anatomy and physiology of the female reproductive system). The academic achievement questionnaire contained questions classified into three parts. The first part of five questions was multiple-choice; the second part of three questions was true or false statements; the third part entailed two complete questions. The correct answer was awarded a score of one, while the incorrect answer was marked zero. Total knowledge was rated according to the credit policy academic achievement categories.

The first category represented very high achievement and included three grades (A+, A, B+), a total score of 90% or more indicated grade A+ or a high level of excellence, an aggregate of 85% to less than 90% meant A or excellent, and scores between 80% to less than 85% were graded B+ or very high good. The second category was labeled satisfactory achievement and encompassed four grades (Grade B, C+, C, and D). Total scores ranging from 75% to less than 80% indicated grade B or very good. Scores between 70% and less than 75% were graded C+ or high good. Aggregates between 65% and less than 70% (Grade C) or good. A total score ranging from 60% to less than 65% was graded D or pass. The third category is named fail (Grade F) was determined by an aggregate score of less than 60%.

IV. Student Satisfaction Questionnaire

The student satisfaction questionnaire was developed by the researchers after reviewing the related literature (**Weerasinghe, & Fernando, 2017)**. It was designed to assess the attitude of students toward the utilized teaching method (traditional lecture for the control group and thinking maps for the intervention group).This instrument consisted of six questions based on a three-point Likert scale in which 0 indicated disagree, 1 indicated somewhat, and 2 indicated agree. The total satisfaction score was classified as satisfactory if the aggregate was more than 50% and unsatisfactory if the summed score was less than 50%.

The Validity and Reliability of the Tools

The tools were sent to five professors in the maternity nursing specialty to confirm their content validity. Their comments were considered, and certain modifications were performed, such as the categorization of items of self-efficacy according to their functions. The reliability of the tools was tested via Cronbach's alpha, and the value for the self-efficacy scale = 0.937, indicating the high reliability of the tool. The Cronbach's alpha value for the student satisfaction score= 0.881, which also indicated elevated reliability of the instrument.

Ethical Considerations

Ethical approval to conduct the study was duly attained from the Faculty of Nursing ethical committee of Mansoura University. Official permission to conduct the study was also taken from the Dean of the Faculty. All students provided informed consent after the aim of the study was elucidated to them. In addition, the questionnaire data were used only for research purposes, and student scores were not included in their evaluation portfolios for the Maternal and Gynecological Nursing course.

Field work

Preparatory Stage

The lecture content (anatomy and physiology of female reproductive system) was initially prepared by the researchers by utilizing the different forms of thinking maps. The study tools were then designed based on the review of relevant literature. A pilot study was conducted on 10% of the predetermined sample to test the clarity of items and to estimate the time required for data collection. A few items were rephrased based on the pilot study, which was thus excluded from the study sample. The result of the pilot study confirmed the adequate reliability and clarity of the data collection tools.

Assessment Stage

The researchers attended Hall A, assigned for the Maternal and Gynecological Nursing course in the Faculty of Nursing at Mansoura University in Egypt. The researchers introduced themselves to the students and subsequently explained the study's aim. The structured interview questionnaire was distributed to the students to fill in their general characteristics. The distribution and collection of the structured interview questionnaire took around15 minutes. After randomization based on the student roster, the students were arbitrarily assigned to two groups: the odd numbers were allotted to the control group (traditional lecturing), and the even numbers were nominated to the intervention group (thinking maps). The researchers then asked the thinking maps group to leave the teaching hall and return after two hours.

Implementation Stage

The traditional lecture group (control group) was instructed using the lecture format conventionally adopted by the maternity faculty for the course. It was delivered via a PowerPoint presentation that included the theoretical content pertaining to the anatomy and physiology of the female reproductive system. After the lecture, every student was allowed to ask for clarifications about the content delivered in the lecture.

The thinking maps group (intervention group) returned to the teaching hall after the traditional lecture was concluded for the control group. The intervention included an introductory session on thinking maps and their appropriate use in the context of the maternity study material. Students were trained on how thinking maps could be utilized and were made to practice (i.e., the functions and proper construction of all eight thinking maps were elucidated, and students were encouraged to utilize them on multiple occasions every day, as well as to understand and recall information on the maternity lecture). However, since every type of thinking map serves a different purpose, the students were encouraged to utilize a bubble map to describe the topic, while a circle map was prescribed for more complex ideas and descriptions by allowing the use of nouns, adjectives, and even complete sentences to describe the given topic. In addition, the students were encouraged to employ the double bubble map for contrast or comparison.

Evaluation Stage

The student academic self-efficacy, academic achievement, and satisfaction scores according to the applied teaching methodology represented the study outcomes. The previously designated study tools (academic self-efficacy, academic achievement, and satisfaction questionnaires) were distributed to the students after they had attended their designated version of the maternity lecture content (The administration and collection of the questionnaires took about thirty minutes).

Statistical Analysis

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). Data were tested for the normality of their distribution prior to the execution of calculations. All variables with continuous data exhibited normal distribution and were expressed in mean ± standard deviation (SD). Categorical data were expressed in number and percentage. The comparisons were determined using the student t-test for variables with continuous data. The chi-square test was deployed for the comparison of variables with categorical data. The reliability (internal consistency) of the self-efficacy scale and the student satisfaction scoring of the learning method was calculated. Statistical significance was set at $p<0.05$.

Results

Table (1) evinces the absence of significant statistical differences between the general characteristics of the traditional lecture and the thinking maps groups at the baseline assessment.

Table (2) illustrates the existence of highly statistically significant differences in all elements of self-efficacy between the traditional lecture and the thinking maps groups ($p<0.001$).

Table (3) presents the mean of the self-efficacy, which was 52.9 ±6.3 for the thinking maps group and 35.4 ± 6.7 for the traditional lecture group, with a highly statistically significant difference noted between the two cohorts ($p<0.001$). In addition, Table 3 demonstrates that more than three-quarters (76.1%) of the thinking maps group reported high self-efficacy levels compared to only 6.8 % of the traditional lecture group.

Table (4) evidences that more than three quarters (78.4%) of the thinking maps group evinced a very high academic achievement according to the credit hours policy compared to only one quarter (25%) of the traditional lecture group, with a highly statistically significant difference observed between the groups ($p<0.001$).

Table (5) clarifies that 81.8% of the thinking maps group compared to only 8% of the traditional lecture group was satisfied with

the applied learning method. More than three-quarters (79.5%) of the thinking maps group was satisfied with the learning method because it helped them easily recall the educational information compared to only 4.5% of the traditional lecture group. Likewise, 77.3% of the thinking maps group compared to 4.5% of the traditional lecture group was satisfied with the learning method because it helped them sequence the educational information. Moreover, 73.9% of the thinking maps group compared to 14.8% of the traditional lecture group was satisfied with the applied learning method because it helped them develop their thinking skills. Highly statistically significant differences were noted between the two groups on all satisfaction elements ($p<0.001$).

Figure (3) denotes that most (94.3%) of the intervention group were satisfied about the thinking maps compared to (14.8%) of the control group who were satisfied about the traditional lectures with highly statistical significant differences between both groups ($p<0.001$).

Figure (4) evidences that there was positive correlation between the control group's self-efficacy and their satisfaction about traditional lectures ($p = 0.028$).

Figure (5) demonstrates that there was positive correlation between the intervention group's self-efficacy and their satisfaction about thinking maps ($p = 0.025$).

Table (1) General characteristics of the studied groups N =176

Variables	Traditional Lecture Group (n=88)		Thinking Maps Group (n=88)		Chi-Square Test	
	No.	%	No.	%	X^2	p
Age (years)						
20 years	82	93.2	81	92.0		
21 years	6	6.8	7	8.0	0.083	0.773
Mean ±SD	20.07 ±0.3		20.08 ±0.3		0.287*	0.775
Gender						
Male	40	45.5	32	36.4		
Female	48	54.5	56	63.6	1.504	0.220
Residence						
Urban	44	50.0	34	38.6		
Rural	44	50.0	54	61.4	2.302	0.129
Average registered hours						
18 hours	82	93.2	79	89.8		
21 hours	6	6.8	9	10.2	0.656	0.418
Mean ±SD	18.2 ±0.8		18.3 ±0.9		0.807*	0.421

** t value, student t-test*

Table (2) Comparison of self-efficacy between the traditional lecture and thinking maps groups N=176

Self-efficacy items	Traditional Lecture Group n=88					Thinking Maps Group n=88					χ^2 [p]
	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %	
Belief that ability can grow with effort											
I can learn what is being taught	27.3	20.5	44.3	4.5	3.4	1.1	2.3	40.9	21.6	34.1	65.954 [<0.001]**
I can figure out anything	0.0	13.6	79.5	2.3	4.5	0.0	1.1	46.6	34.1	18.2	48.584 [<0.001]**
If I practiced every day, I could develop any skill	0.0	11.4	81.8	4.5	2.3	0.0	2.3	40.9	22.7	34.1	52.500 [<0.001]**
Once. I decide to accomplish a task, I keep trying to do it	0.0	15.9	77.3	2.3	4.5	0.0	2.3	39.8	23.9	34.1	55.151 [<0.001]**
I am sure that I will achieve my stated goals	13.6	17.0	37.5	31.8	0.0	1.1	0.0	23.9	51.1	23.9	51.933 [<0.001]**
I focus on my ability when I struggle to accomplish a difficult task	0.0	14.8	78.4	3.4	3.4	0.0	2.3	36.4	27.3	34.1	60.045 [<0.001]**
I will succeed in whatever career path I choose	9.1	6.8	77.3	4.5	2.3	0.0	0.0	44.3	35.2	20.5	55.488 [<0.001]**
I will succeed in any task assigned to me	0.0	23.9	68.2	3.4	4.5	0.0	1.1	39.8	25.0	34.1	59.083 [<0.001]**
Belief in the ability to meet specific goals or expectations											
I believe hard work pays off	20.5	37.5	11.4	29.5	1.1	1.1	2.3	23.9	40.9	31.8	73.322 [<0.001]**
My ability grows with my efforts	0.0	85.2	10.2	1.1	3.4	0.0	8.0	33.0	22.7	36.4	108.136 [<0.001]**
I believe that the brain can be developed like muscles	27.3	17.0	34.1	17.0	4.5	1.1	2.3	3.4	11.4	81.8	115.034 [<0.001]**
I believe I can increase my talent levels	0.0	80.7	14.8	3.4	1.1	0.0	10.2	3.4	4.5	81.8	123.498 [<0.001]**
I believe I can change my ability levels	13.6	13.6	51.1	5.7	15.9	1.1	0.0	3.4	0.0	95.5	113.058 [<0.001]**

***P-value <0.001 highly statistically significant.*

Table (3): Comparison of the total self-efficacy level between the traditional lecture and thinking maps groups N =176

Self-Efficacy Level	Traditional Lecture Group (n=88)		Thinking Maps Group (n=88)		Chi-Square Test	
	No.	%	No.	%	X^2	p
Low	72	81.8	4	4.5	113.630	<0.001**
Moderate	10	11.4	17	19.3		
High	6	6.8	67	76.1		
Mean ±SD	35.4 ±6.7		52.9 ±6.3		17.845*	

** t value, student t-test---**P-value <0.001 highly statistically significant*

Table (4): Comparison of the academic achievement between the traditional lecture and the thinking maps groups N =176

Students' Academic Achievement	Traditional Lecture Group (n=88)		Thinking Maps Group (n=88)		Chi-Square Test	
	No.	%	No.	%	X2	p
Very high performance					50.303	<0.001**
Very high good (B+)	54	61.4	16	18.2		
Excellent (A)	22	25.0	69	78.4		
Satisfactory performance						
Very good (B)	12	13.6	3	3.4		

***P-value <0.001 highly statistically significant*

Table (5): Comparison of student satisfaction about learning methods in the traditional lecture and thinking maps groups N =176

Students' Satisfaction	Traditional Lecture Group (n=88)			Thinking Maps Group (n=88)				
	Disagree	Somewhat	Agree	Disagree	Somewhat	Agree		
	%	%	%	%	%	%	χ2	[p]
I am satisfied with using this learning method	77.3	14.8	8.0	5.7	12.5	81.8	108.018	[<0.001]**
Learning method helped me sequence my educational information	73.9	21.6	4.5	8.0	14.8	77.3	104.736	[<0.001]**
Learning method helped me easily recall my educational information	69.3	26.1	4.5	6.8	13.6	79.5	107.471	[<0.001]**
Learning method was helpful in the development of my thinking skills	65.9	19.3	14.8	11.4	14.8	73.9	69.082	[<0.001]**
I would prefer this learning method in the future based on the arrangement of ideas	63.6	21.6	14.8	14.8	22.7	62.5	52.764 b	[<0.001]**
I would recommend the use of this learning method to my colleges	59.1	33.0	8.0	17.0	22.7	60.2	57.353	[<0.001]**

***P-value <0.001 highly statistically significant*

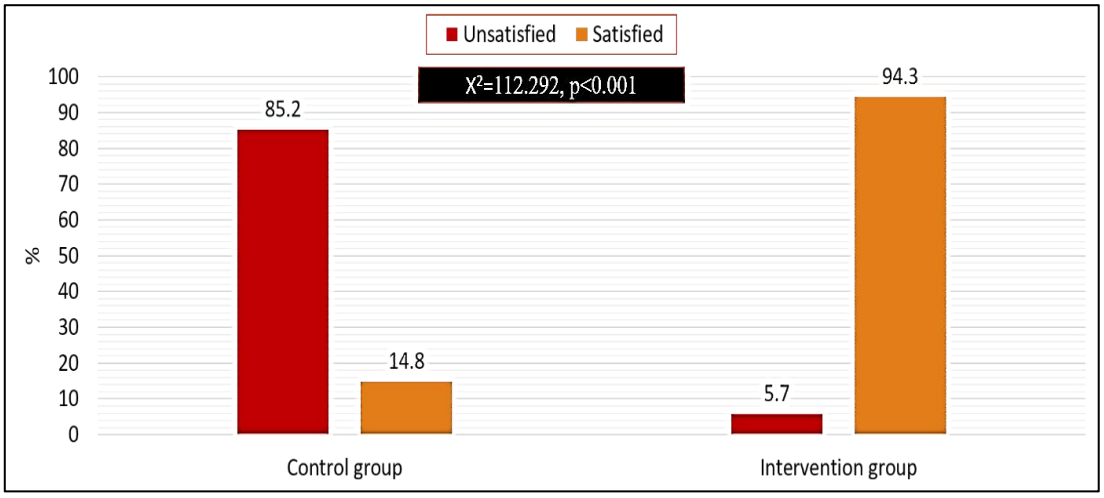


Figure (3) Comparison of the satisfaction levels between the traditional lecture group (control group) and the thinking maps group (intervention group)

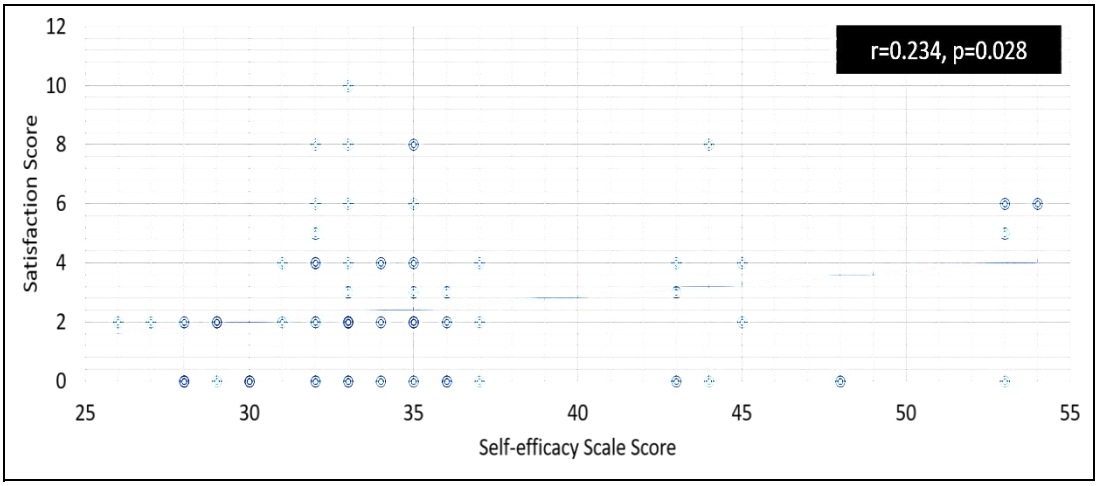


Figure (4) The correlation between the total self-efficacy and the total satisfaction scores for the traditional lecture group

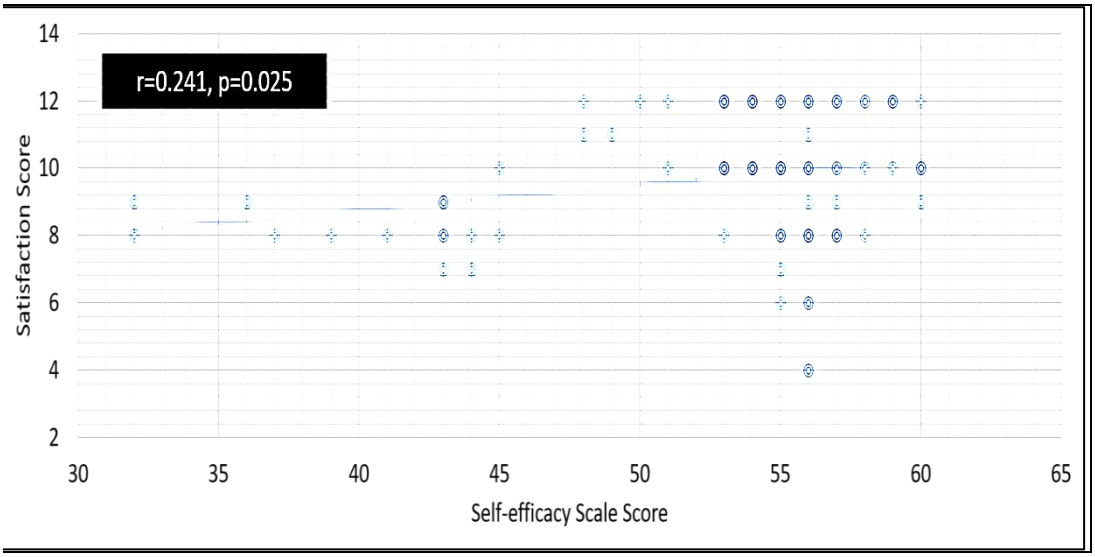


Figure (5) The correlation between the total self-efficacy and the total satisfaction scores for the thinking maps group

Discussion

Thinking maps are creative teaching and learning tools that are used in classrooms to successfully promote metacognition in students. The present study investigated the effects of thinking maps versus traditional lectures on the academic self-efficacy, achievement, and satisfaction of undergraduate maternity nursing students. The present study findings supported the first study hypothesis ,"Undergraduate maternity nursing students instructed through thinking maps exhibit a higher level of academic self-efficacy than those taught through traditional lectures." The current study's outcomes revealed that the mean score of the self-efficacy for the thinking maps group was significantly increased compared to those in the traditional lecture group. In addition, more than three-quarters of the thinking maps group compared to minority of the traditional lecture group reported high self-efficacy, and a highly statistically significant difference was observed between both groups.

This study's findings may be credited to the knowledge that thinking maps can improve both elements of the perception of levels of proficiency by students; the belief that their abilities can be developed through effort as well as the belief in their capability to achieve specific goals or expectations. Thus, the first study hypothesis was confirmed. To the best of the knowledge of the authors, this study is the first to investigate the effects of thinking maps on students' self-efficacy.

In terms of academic achievement, the present study revealed that almost four-fifths of the thinking maps group compared to only a quarter of the traditional lecture group registered a high performance and a highly statistically significant difference was evident between the two groups. This result may be attributed to the fact that the thinking maps motivated students to study the delivered material easily and in a creative manner and students could easily recall the educational information when they were required to do so during the examination. Thus, the second study hypothesis was also validated: "Undergraduate maternity nursing students instructed through thinking maps exhibit a higher academic achievement than those taught through traditional lectures."

The results reported by the present study support the findings of **Long and Carlson's (2011)** survey to determine the effectiveness of thinking maps on student achievement. Those authors reported that students could achieve

greater understanding when they constructed thinking maps compared to students who used the conventional method of learning. In addition, the outcomes of the present study are aligned with the results of an experimental study conducted by **Abdullah (2019)** on fifty-four students to investigate the impact of thinking maps on their academic achievement. Abdullah found a statistically significant difference in favor of the experimental group between the mean performances of the experimental group, which utilized thinking maps, and the control group, which received a traditional lecture.

In addition, the findings of the present study revealed a positive correlation between academic self-efficacy and academic achievement of undergraduate maternity nursing students. This outcome could be due to the increased probability of students sensing high self-efficacy to use cognitive strategies, organize their time, and regulate their efforts. Hence, students with high self-efficacy tend to attain higher grades in academic evaluations. This finding is congruent with a study conducted in Lima in Peru, through which the researcher discovered that the academic self-efficacy of students was significantly and positively correlated with their academic performance **(Alegre, 2014)**.

With respect to student satisfaction, the present study revealed that most of the intervention group was satisfied about thinking maps, while a minority of the control group expressed satisfaction about the traditional lectures. This result may be ascribed to the ability of thinking maps to make the learner cooperate more in the learning process, while the traditional lecture format always follows one-way communication and positions students as passive partners in the learning process. Thus, the third study hypothesis was also confirmed:" Undergraduate maternity nursing students instructed through thinking maps are more satisfied about their learning method than those taught through traditional lectures."

A quasi-experimental Egyptian study conducted by **(Khedr & Hassan, 2015)** to evaluate the effectiveness of concept maps on student satisfaction found equivalent results. Concept maps were utilized as a visual creative learning instrument before thinking maps evolved. Khedr and Hassan reported the finding of a statistically significant difference in favor of the concept maps between their experimental (concept map) and control (lecture) groups. The similarities in the outcomes of the present and extant studies may be due to the ability of any form of creative learning instruments such as thinking maps or concept maps to help students reduce learning barriers and foster personal beliefs in their capabilities. These capacities of creative pedagogic tools reflect on the satisfaction of students with their learning methods.

The present study's results revealed a positive correlation between the self-efficacy and satisfaction of students with the learning method of creating thinking maps. The study outcomes were also congruent with another experimental study **(Van de Ridder, Peters, Stokking, de Ru, & ten Cate, 2014)** that confirmed a positive relationship between self-efficacy and satisfaction expressed by students with the learning method.

Conclusion

The three study hypotheses were accepted based on the present study findings, indicating that thinking maps are effective as teaching strategies and exert significant statistical impact on the academic self-efficacy, academic achievement, and satisfaction sensed by undergraduate maternity nursing students.

Recommendations

- Thinking maps should be applied in other educational courses to enhance the self-efficacy, academic achievement, and satisfaction of students.
- Both teachers and students should attend training workshops on the importance, applications, and types of thinking maps.

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