



## **Effect of Using Electronic Mind Maps as a Teaching Strategy on Academic Vitality, Self-Efficacy, and Achievement among Nursing Students**

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### **ABSTRACT**

**Background:** Electronic mind maps are one of the innovative learning approaches that help to improve students' achievement and self-efficacy. **Aim:** Examine the effect of using electronic mind maps as a teaching strategy on academic vitality, self-efficacy, and achievement among nursing students. **Design:** A quasi-experimental design with (pretest-posttests, case, and control groups) was utilized to conduct the study. **Setting:** The current study was conducted at the Faculty of Nursing, Menoufia University, Egypt. **Subjects:** A convenience sample of 400 new entry students was divided equally into study group and control group. **Tools:** included (1) Academic vitality questionnaire, (2) Academic Self- Efficacy Scale, (3) Academic achievement questionnaire, and (4) Student Satisfaction Scale. **Results:** The study revealed that mean scores of academic vitality of electronic mind mapping and conventional groups were  $82.85 \pm 15.12$  &  $57.85 \pm 18.16$  respectively in the post-test. Also, it reported that the mean scores of academic self-efficacy of the electronic mind mapping and conventional groups were  $175.39 \pm 30.97$  and  $129.76 \pm 32.21$  respectively in the post-test. In addition, the mean scores of academic achievement for the electronic mind mapping and conventional groups are  $17.48 \pm 2.76$  &  $13.98 \pm 2.75$  respectively in the post-test. In addition, it showed that 86% of the students in the electronic mind-mapping group were satisfied, while only 55% in the conventional group were satisfied. **Conclusion:** Electronic mind maps are an effective and powerful tool that enhances nursing students' academic vitality, self-efficacy, and achievement. **Recommendations:** Electronic mind maps should be implemented as an acceptable teaching strategy for all courses of nursing students' education.

**Keywords:** Academic achievement, Academic vitality, Electronic mind map, Students' self-efficacy.

## Introduction

Twenty century is an era where digitalization occurs in everything. Education is coping with the needs of industrial revolution where individuals and technology are ranged to empower new possibilities (Zhang et al., 2018). In nursing, there have been changes to the educational programs and teaching methods, which are designed to rise students' responsibility for active participation and their learning to ensure lifelong continuing education. Nurse educators have the main responsibility in generating learning experiences that assist students to be better learners (Hussin, 2018).

Stimulating nursing students' abilities through a variety of innovative learning to encourage them to think creatively is one attempt in the time of revolution. One of them is applying a mind-mapping method in learning nursing courses. The mind mapping is an active learning strategy that participates of improving memory, producing creative ideas, and regulating how to get information (Kyoko and Hiroko, 2019).

Traditional mind maps and electronic mind maps are the two types of mind maps (e-mind maps). Electronic mind maps refer to the application of the same steps in a traditional method using computer software to automatically generate flow branches of an idea from the central one. Traditional mind maps are created on the board using paper and a pen (Aljaser, 2017).

Electronic mind maps (E-mind maps), which rely on quick and specialized computer software, are more attractive and useful than traditional mind

maps. The reader is drawn in by the photographs, colors, and sketches that are included. Additionally, when images and symbols are added, the ideas can be changed or moved. E-mind maps are typically used to display relationships between ideas and information (Mento et al., 2019).

By using e-mind maps in the classroom, instructors may help students organize their ideas, acquire complex knowledge, add lists and links, attach files, and collaborate. Additionally, since computer software already comes with readily usable graphics, clipart, and sketches, creating an e-mind map does not require a high level of talent (Al-Mutairi, 2016).

E-mind maps also help nursing students learn quickly, learn a lot, and think freely without being constrained. It enhances learning and sparks the imagination of the students. They can also swap out maps and rearrange the signs. In addition, mind maps can be utilized for self-learning because it promotes inquiry and image integrates the concepts, and fills the gap between theory and practical competence (Abdulbaset, 2016).

Electronic mind mapping strategy has the main role in raising students' academic achievement through raising academic vitality, and academic self-efficacy (Al-Shdaifat et al., 2019). E-mind maps affect academic vitality by increasing the ability to respond positively, constructively, and adaptively to a variety of challenges and impediments that arise during one's education. Academic vitality is seen as a source of empowerment for learners' educational adaptation (Mento et al., 2019).

Lack of academic vitality is one of educational challenges that students face during teaching courses as a disconnection between educational aspirations and expectations, lack of interactions with teachers, failure to complete the homework, poor marks, poor academic performance, and academic burnout (Akhlaghi & Ganji, 2019).

E-mind maps affect academic self-efficacy by increasing the students' chances of success and giving them the ways for living a better life. Students become confident in any type of academic challenge and try to avoid any risks during the period of achieving academic goals (Abid, et al., 2019).

Academic self-efficacy can depend on the student's orientation or academic experiences, interpersonal relationships, students' assessment methods, study strategies for the students, and personal difficulties. Academic self-efficacy has been established to be predictor of the student's academic performance (Li et al. 2021).

Academic vitality and self-efficacy affect overall academic achievement, and outcomes and play a predictor of student's success in all fields (Guo et al., 2019; Zhang et al., 2018). E-mind mapping influences academic achievement by improving performance outcomes and demonstrates competence in extracurricular activities (Hayat et al., 2020).

Using E- mind maps help the students illustrate their vision, present contextual knowledge, and make associations about a central topic. E- mind maps can also be used for note-taking, completing

homework assignments, coordinating exams, and improving nursing practice (Schneider and Preckel, 2017).

### **Significance of this study:**

Nurse educators around the world have been interested in developing educational strategies in the faculties, through the change of the student's performance by using electronic mind maps in learning. In addition, there is an important need for the faculty to change the traditional method of teaching into the implementation of a student-centered learning environment. Increasing learning experiences that facilitate knowledge-building, awareness, problem- solving, and precarious thinking is important (Mafla et al., 2019).

E- Mind maps can be implemented in nursing as an alternative teaching strategy tool because they help educate students to solve problems that face them in a variety of clinical practice settings, and think critically in a health care environment. Also, it helps nursing students to communicate and share information leading to raising their academic vitality, improving students' judgment of their capabilities, organize and execute them to accomplish academic achievement levels (Yan, et al., 2022).

Therefore, it is vital to perform this study to investigate the importance of implementing electronic mind maps in nursing courses to facilitate teaching with new and easily method and improve academic vitality, self-efficacy, and achievement.

## Aim of the study

The current study aims to assess the effect of using electronic mind maps as a teaching strategy on academic vitality, self-efficacy, and achievement among nursing students.

## Research hypothesis

H1 -Nursing students who will learn by electronic mind maps will have an improvement in their academic vitality, self-efficacy, and achievement.

H2- There will be a significant difference between study and control groups regarding academic vitality, achievement, and self-efficacy post-intervention than pre- intervention.

H3- Nursing students' satisfaction with courses will be improved after using electronic mind maps as a teaching strategy

## Subjects and Method

### Research design

A quasi-experimental research design (pretest - posttests, study and control groups) was used in the study.

### Study setting

The current study was conducted at the Faculty of Nursing, Menoufia University, Egypt.

### Study sample

A convenience sample of 400 new entry male and female nursing students was enrolled to participate in the study. They are in the first level of baccalaureate nursing programs at Faculty of

Nursing, Menoufia University during the second semester of the academic year 2021- 2022.

### Group assignments:

The first- year nursing students were 400 students taken as a convenience sample to be enrolled in the current study. The sample was divided randomly into two equal groups, 200 students as a study group (using the mind maps strategy) and 200 students as a control group (using traditional teaching strategy as lecture). Randomization was done by writing a numbered name list of the students. Odd numbers represented the study group and even numbers signified the control group.

### Data Collection Tools

The researchers used four tools to collect data as the following:

#### Tool I: Academic Vitality Questionnaire

This instrument was adopted by **Klukas (2020)** and **Victoriano (2016)** to assess nursing students' perception of academic vitality through (20) items. Each item was measured on a five- point Likert Scale where (1) indicate strongly disagree to (5) meant strongly agree. In this questionnaire, the range of scores for this tool differs from (20 –100), and the total score is 100, a higher score in this questionnaire showed a higher academic vitality level.

**Scoring system:** Levels of Academic Vitality represented statistically based on the cut of value into  $\geq 75\%$  = scores from (75-100) as high level;

60% - <75% = scores from (60-74) as moderate level and <60% = scores from (20-59) denotes low level.

### **Tool II: Academic Self-Efficacy Scale**

This instrument was adapted from **Gafoor and Ashraf (2007)** and modified by the researchers. It included forty-closed ended questions. Among the forty items, twenty statements are negative while the other twenty statements are positive. Item responses are organized from 1 (Exactly false) to 5 (Exactly true).

**Scoring system:** Levels of academic self-efficacy represented statistically based on cut of value into  $\geq 75\%$  = scores from (150-200) as high level; 60% - <75% = scores from (120-149) as moderate level and <60% = scores from (40-119) denotes a low level

### **Tool III: Academic achievement Questionnaire**

This instrument was developed by the researchers and this scale consists of 20 questions (five questions for each selected topic) in the health education course. Each response answer took one score. The highest score was 20 and the lowest was zero.

**Scoring system:** Levels of Academic achievement represented statistically based on the cut of value into  $\geq 75\%$  (15-20 scores) as high level; 50% - <75% (10-14 scores) as moderate level and <50% (1-9 scores) denotes low level

### **Tool IV: Students Satisfaction Scale**

This instrument was developed by **Zaharah, 2011** and used to determine students' satisfaction

with the two used learning experiences either mind maps or traditional.

**Scoring system:** Each item was measured on a five-point Likert Scale (1) indicate strongly disagree (5) meant strongly agree. In this questionnaire, the range of scores for this tool varies from (5 – 25), the highest scores revealed high satisfaction.

### **Validity of instruments:**

The tools of this study were tested for their validity (face & content) through the distribution of the tools to a panel of experts consisted of two professors from Family and Community Health Nursing and two assistant professors From Nursing Administration and Medical Surgical Nursing specialty. The instruments were tested for accuracy and internal validity. The modifications needed for the completeness and the clarity were integrated into tools.

### **Testing Reliability:**

All tools were tested for reliability using the Cronbach Alpha Coefficient factor test and were found to be reliable ( $\alpha = 0.806$ ) for tool I, ( $\alpha = 0.85$ ) for tool II, ( $\alpha = .88$ ) for tool III, and ( $\alpha = .98$ ) for tool IV respectively.

### **Administrative and Ethical Considerations:**

The official letter was granted from the Dean of Nursing Faculty to conduct the intervention study. Then, informed written consent were gained from the students after clarifying study purpose, its nature, and the importance of their honesty in the feedback given. They were reassured that data would be used only for scientific research and not

affect on their grade in the course. The students' rights were protected by ensuring voluntary participation in the study.

### **Pilot study**

A pilot study was done on 10 % of the study sample (40 nursing students) to evaluate study instruments in terms of their clarity, applicability, and time required to fulfill all the study instruments and to explore their feasibility. The accuracy modification and exclusion of students who participated in the pilot study were done.

### **Data Collection Procedure**

-The data was collected in the second semester of the academic year 2021-2022. The data was collected in 2 months (from mid of February till the mid of April)

-At the beginning of the study, the researchers met with the students (face to face) in order to explain the purpose and study procedure. The students who consented to participate were categorized into two groups (study group and control group). Then, the researchers gave the data collection instruments to both groups to fill pre-test before intervention and the students were informed to write their age and sex on the top of the questionnaire.

- After that, the researchers began to provide instructions about educational guidelines during sessions to the study group about the selected four topics related to health education course provided by lecturers of Family and Community department. The study group had gotten six sessions.

- Each session was provided via blackboard platform (using Microsoft Teams) which included the theoretical and practical parts of the selected topic, one session per week lasted 90-120 minutes (each session included 10-20 minutes for the preparation or discussion before beginning the explanation of new health education topic and 10-20 minutes for providing conclusion at the end of the topic explanation).

-Each session included explanations using lectures using data shows and also group discussions. The sessions are classified as the following:

**First session** included knowledge about basic concepts related to mind maps, advantages, and principles of forming E- Mind Maps. The researchers instructed the student how to form E-mind maps using computer software such as Microsoft Word. This program cannot require higher skills to be used. The researchers explained E- Mind Maps using PowerPoint presentations and educational videos. Then, the researchers divided the students into small subgroups (each group consisted of ten students) and trained them on E-mind maps, and the student re- demonstrated it.

**Second session** included explanations of human and health behavior topic which incorporated definition of related terms, purpose of motivating health behavior, types of health behavior, factors affecting behavior, role of health education in behavior change, and stages of behavior changes

**Third session** included knowledge about health communication topic, which included role of health communication in health education, therapeutic communication, importance of communication, principles of communication, types of communication, communication process, and steps of communication process.

**Fourth session** included knowledge about health education material and methods topic. It included teaching material, types, its advantages, disadvantages, how to use each material, teaching methods, types, advantages, disadvantages, and how to use each method.

**Fifth session** included an explanation of health education process topic. It included purpose dimensions model components and its phases.

-In each session, the researchers provided example of E-mind maps for each units and as a practical part of the lecture. Then, the small subgroups of the student were informed to construct E- mind mapping activity for each unit outside of the class time using textbook, handouts, class notes, and Microsoft Word

**Sixth session**, the researchers began to provide revision on the developed e-mind maps of the four units with students and correct any misconceptions.

- Students were provided the chance to ask any question related to the technique and its application during training course at the termination of each session. Students were informed to be in connection with the researchers by telephone for any questions or guidance.

- The students of the control groups were exposed to the traditional teaching method as lectures via blackboard platform (using Microsoft Teams) for the same selected four units of health education course in the same study period.

-After two weeks later from the six session, the researchers gave the same data collection instrument to fill the posttest to assess students' academic vitality, self-efficacy, and achievement after using e- mind maps. In addition, they were provided a questionnaire to assess satisfaction regarding teaching methods used for health education course after intervention.

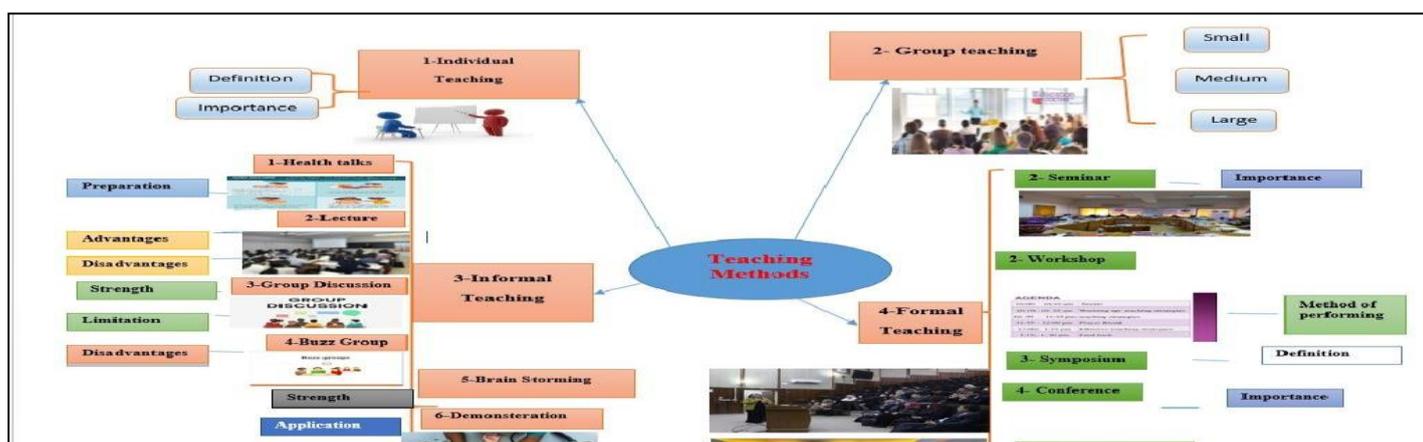


Figure 1: Example of E- Mind Map of one unit in health education

Group	Pre test	Manipulating	Posttest	Discussion and interpretation of findings to evaluate effectiveness of E- mind mapping
Study group ( learner)	Academic Vitality scale.	Teaching using e- mind maps (X1)	- Academic Vitality scale.	
Control group ( learner)	- Achievement questionnaire - Self-efficacy questionnaire	Teaching using lecture (convenience ) method (X2)	- Achievement questionnaire - Self-efficacy questionnaire - Satisfaction Scale	

### Statistical analysis:

Data was entered and analyzed by using SPSS (Statistical Package of Social Science) version 22 (SPSS, Inc, Chicago, Illinois, USA).where statistics were applied as the following:

While qualitative data were given as numbers and percentages, quantitative data were presented as mean and standard deviation (SD). Chi-square tests were used to compare qualitative variables (X2). The Mann-Whitney test was used to compare two groups with quantitative data that are not normally distributed. Additionally, the mean of the same groups was compared using a paired t-test. For all significant tests, the level of significance was set at p .05.

### Results

**Table (1)** presents that the mean scores of academic vitality for the electronic mind mapping and conventional groups are  $82.85 \pm 15.12$  &  $57.85 \pm 18.16$  respectively in post- test. Also, the table shows that, in post- intervention the mean score of academic self-efficacy of the electronic

mind mapping group is  $175.39 \pm 30.97$ . Meanwhile, the mean score of academic self-efficacy of the conventional group is  $129.76 \pm 32.21$ . In addition, the mean scores of academic achievement for the electronic mind mapping and conventional groups are  $17.48 \pm 2.76$  &  $13.98 \pm 2.75$  respectively in post-test.

**Figure (1)** shows that, 16.5% & 17.0% of the studied students of the electronic mind mapping and conventional groups respectively have high academic vitality on pre intervention. Meanwhile in post intervention, 58.5% of the electronic mind-mapping group while 35.0% of the conventional group studied have high academic vitality.

**Figure (2)** clarifies that 19.5% of the studied students in the electronic mind-mapping group have high academic self-efficacy in pre intervention. In post intervention, 66.0% of them have high academic self-efficacy. Meanwhile, 30.0% of the studied students in the conventional

group have high academic self-efficacy on post intervention.

**Figure (3)** shows that, 98.0% & 93.5% of the studied students of the electronic mind mapping and conventional groups respectively have low academic achievement in pre intervention. Meanwhile in post intervention, 86.5% of the electronic mind mapping group and 69.0% of the conventional group studied have high academic achievement.

**Table (2)** presents that there is no statistical differences of mean scores of academic vitality, academic self-efficacy, and academic achievement in relation to gender of the studied students of electronic mind mapping and conventional group on pre and post intervention.

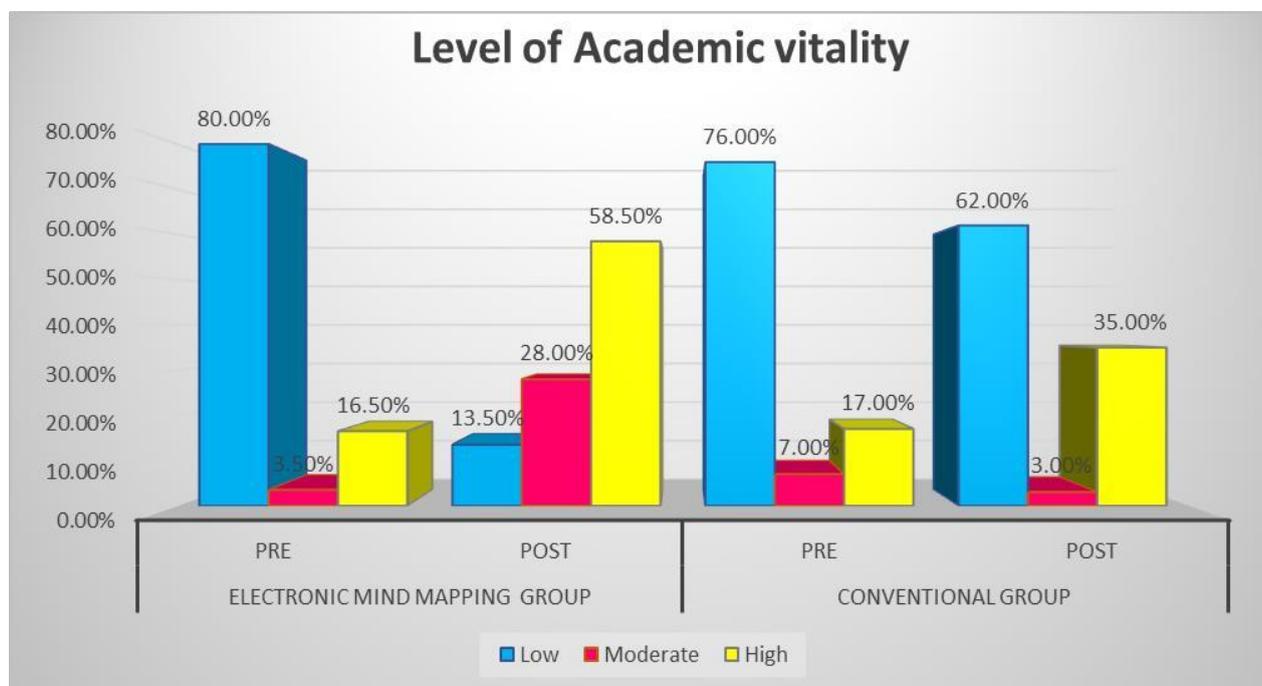
**Figure (4)** clarifies that 86% of the students of electronic mind- mapping group was satisfied, while only 55% in the conventional group was satisfied.

**Table (1):** Comparison of total mean score of academic vitality, self-efficacy and achievement in pre and post intervention for electronic mind mapping and conventional groups (n=400)

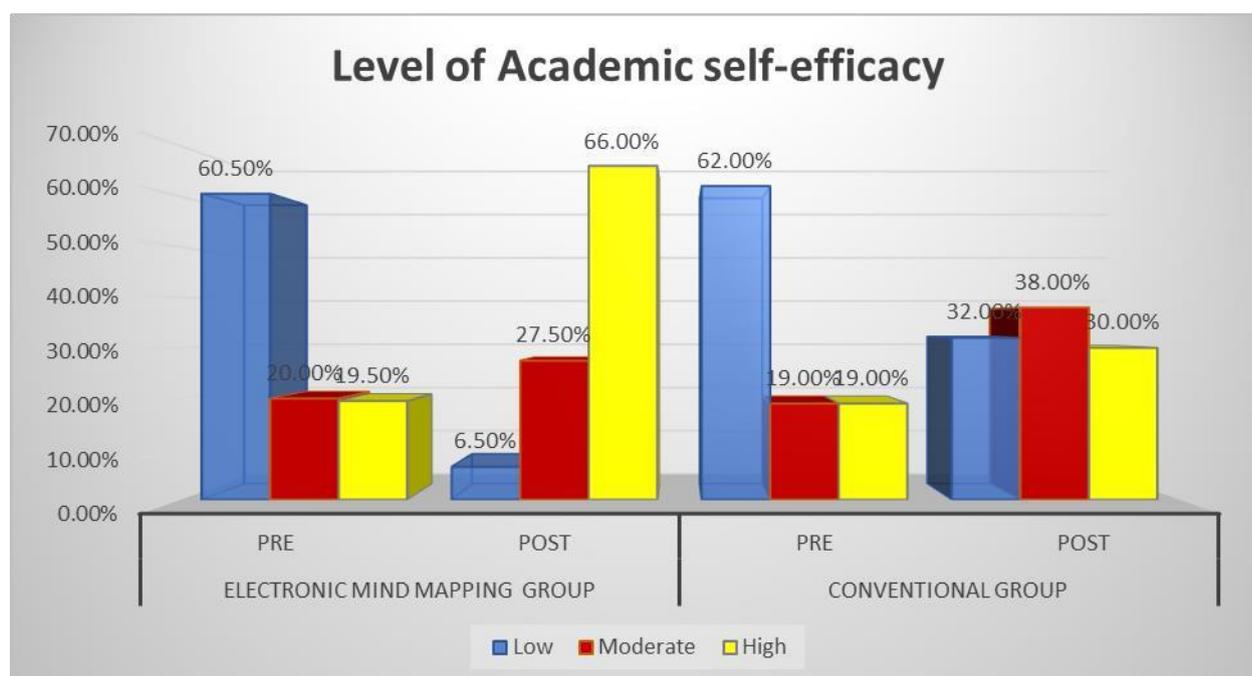
Item	Electronic Mind Mapping group	Conventional group	Mann-Whitney test	P-value
	X ± SD	X ± SD		
<b>Total academic vitality</b> <i>Pre intervention</i>	44.56 ± 19.73	45.46 ± 19.72	.299	.765
	82.85±15.12	57.85±18.16	14.745	.000**
Paired t test P-value	-33.829.000**	-18.271.000**		
<b>Total academic self-efficacy</b> <i>Pre intervention</i>	89.07 ±35.26	89.61 ±33.5	-.118	.906
	175.39±30.97	129.76±32.21	14.374	.000**
Paired t test	-30.604 .000**	-21.637 .000**		
<b>Total academic achievement</b> <i>Pre intervention</i>	4.44 ±2.17	4.43 ±2.59	0.399	.665
	17.48 ± 2.76	13.98 ±2.75	9.579	.028**
Paired t test P-value	-32.813 .000**	-28.846 .000**		

NB: High Significant (p<.001)

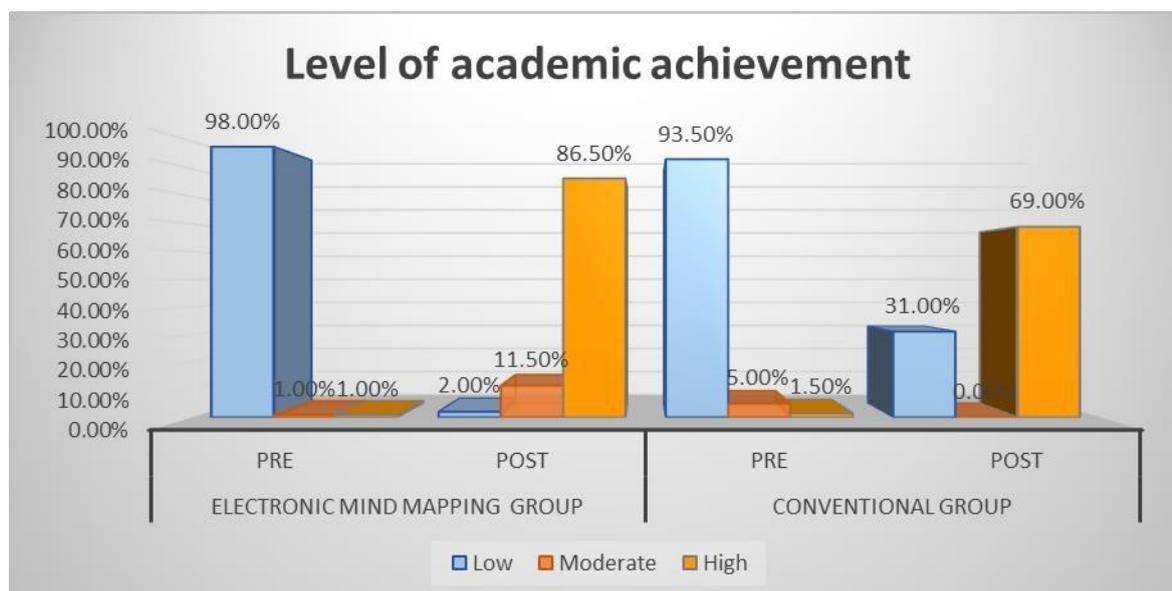
Not Significant (p>0.05)



**Figure (1):** Level of academic vitality in pre and post intervention for electronic mind mapping and conventional groups (n=400).



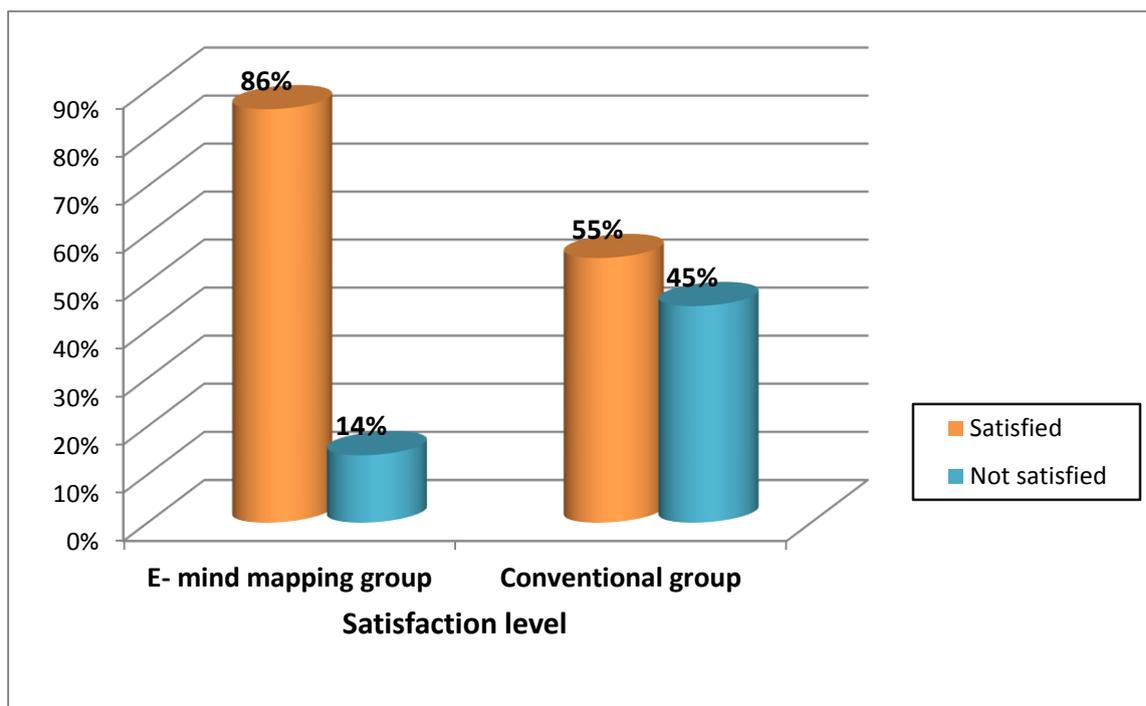
**Figure (2):** Level of academic self-efficacy in pre and post intervention for electronic mind mapping and conventional groups (n=400).



**Figure (3):** Level of academic achievement in pre and post intervention for electronic mind mapping and conventional groups (n=400).

**Table (2):** Mean scores of academic vitality, self-efficacy, and achievement, in relation to gender of the studied students of electronic mind mapping and conventional group in pre and post intervention (n=400).

Items	Electronic Mind Mapping group		Conventional group	
	<i>Pre intervention</i>	<i>Post intervention</i>	<i>Pre intervention</i>	<i>Post intervention</i>
<b>Academic vitality</b>				
Male	43.98 ±19.03	82.98 ±15.58	45.94 ±19.79	58.18 ±18.34
Female	44.85 ±20.14	82.84 ±15.85	44.68 ±19.76	57.64 ±18.12
<i>Mann-Whitney test</i>	-.294	.057	.439	.203
<b>Academic self-efficacy</b>				
Male	84.97 ±38.08	175.25 ±31.02	90.88 ±34.86	131.40 ±33.17
Female	84.55 ±38.49	175.30 ±31.39	87.32 ±32.74	128.32 ±32.22
<i>Mann-Whitney test</i>	.072	-.010	.725	.646
<b>Academic achievement</b>				
Male	4.49 ±2.26	16.04 ±4.70	4.66 ±2.45	12.00 ±4.76
Female	4.41 ±2.12	17.95 ±3.80	4.77±2.68	13.98 ±4.77
<i>Mann-Whitney test</i>	.451	.339	-.435	.093



**Figure (4):** Distribution of students' satisfaction level according to methods of teaching used after intervention among students in electronic mind mapping and conventional groups (n=400).

## Discussion

Electronic mind maps are a helpful tool in expressing the building of information in a topic and help nursing students recall information, and solve problems. Therefore, mind map is an important teaching strategy that can be applied in education.

The present study pointed to that, the mean scores of academic vitality for the electronic mind mapping were higher in posttest than among conventional groups. The current study's findings were consistent with those of **Al-Balawi, (2015)** who looked at how both concept maps and computed mind maps affected the development of creative thinking skills in the middle school curriculum in Saudi Arabia. He discovered that

e-mind maps help pupils become better at problem-solving, reflective thinking, and creative thinking. The development of such skills can help to raise the academic and promotes understanding for the study methods. The similarity in results with other studies might be related to that the e-mind maps boost students' cognitive functions of the brain, enhance memory performance, and facilitate learning process through raising. As a result, students' retention of course material during exams is improved, which raises academic vitality.

The present study results revealed that on post-intervention the mean scores of academic self-efficacy were higher among the electronic mind-mapping group than in a conventional group. This

finding was consistent with **Mohaidat, (2018)** who studied the effect of e- mind maps on reading comprehension among pupils. Who reported that using the electronic mind maps increase students' understanding after intervention, concentrates the information in the students' minds, and raises their academic self-efficacy. In addition, the current study findings agreed with the findings of **Baskaran et al, (2014)** who studied effect of mind map on improving the academic self-efficacy among B.Sc (Nursing) students. They reported that there was a significant enhancement of academic self-Efficacy among the studied students in posttest after administration of e- mind map.

In the same line , **Yan et al, (2022)** who studied improving students' self-efficacy in creativity and performance using of self-assessment mind maps. They concluded that the students in the experimental group significantly had improved in self-efficacy related to creativity after the intervention than those in the control group. The similarity in results with other studies could be due to that equipping the students with more information on online resources and instructional guidelines regarding learning strategies as electronic maps is very important. All forms of e-learning aids are important to enhance nursing students' learning process and thus improve their academic self-efficacy.

According to the current research, there were statistically significant variations between the mind mapping group's mean scores on the post-achievement exam and those of the conventional group at the level of  $\leq 0.05$ . The findings were in

the same context with **Jbeili (2013)** who examined how digital mind maps affected Saudi Arabian sixth-graders' academic performance. They discovered that using electronic mind maps instead of traditional ones helped pupils perform better in science courses.

In addition, the results were in the same line with **Al-Shdaifat et al. (2019)** who examined impact of the electronic mind mapping strategy on the academic achievement in the terms of English vocabulary. They discovered that electronic mind mapping strategy increases pupils' vocabulary and enhanced their achievement. Additionally, **Al-Omari and Al-Dhoon (2020)** assessed the impact of e-mind mapping on the performance of Jordanian 10th-grade biology students. Who reported that after intervention, the e-mind mapping method has a favorable impact on students' achievement. The current study's findings were consistent with those of **Kaddoura et al.(2016)**, who found that first-year nursing students in the Bachelor of Nursing program who learnt using mind mapping had superior posttest scores than their peers who learned using the traditional technique. The results' congruence with other findings could be explained by mind mapping's efficacy in raising students' accomplishment, understanding, and retention when used as a component of an instructional strategy. Also, it permits the students to appreciate the information with development in their grade values.

The current results revealed an improvement of levels regarding academic vitality, academic self-efficacy, and academic achievement among mind

mapping group than conventional group after intervention. These findings agreed with **Jaafarpour et al, (2016)** who assessed the effect of concept mapping as a teaching method for the nursing students. The findings indicated the use of e-mind mapping depends on their higher post-test scores compared with conventional methods group. In addition, their scores indicated gradual improvement throughout the sessions of the intervention. Also, the results were supported by **Bawaneh, A. (2019)** who studied the reliability of mind-map assessment rubric in a group of medical students and recommended using mind mapping. The majority of students recommend integrating mind map during training and using it in workshops to be a part in the clinical work.

Furthermore, these findings supported by **Spoorthi, et al., (2019)** who performed a study on mind mapping- as effective learning adjunct to obtain a tsunami of information. They indicated that the majority of the trainees thought mind mapping helped in understanding concepts and ideas in science. Moreover, mind mapping can help in self-learning. The similarity in results could be due to that application of electronic mind maps was effective in enhancing vitality, and critical thinking, which improve self-efficacy of students and thus their achievement.

The current study findings showed that there were no statistical variations in mean scores of academic achievement, academic vitality and academic self-efficacy with the gender of the studied mind mapping students and conventional group on pre and post- intervention. The results

were in line with those of **Mahasneh (2017)**, who looked at how using mind mapping affected students' performance and attitudes in an introductory educational psychology course. They stated that gender has no impact on students' learning or performance. This similarity might be due to that learning difficulties may be prevented by nursing students regardless of their sexes when the right method and teaching strategies as electronic mind maps are applied.

Regarding students' satisfaction in relation to health education course according to teaching method used among mind mapping group and conventional group. The current study indicated that the students in mind mapping group were highly satisfied with using electronic mind maps than those in conventional group. This result agreed with **Hsu et al, (2016)** who assessed an experimental study to compare satisfaction level among nursing students using mind maps with the control group taught by lectures in Taiwan. They reported that higher mean scores of satisfaction with mind map among study group than in the control group. This similarity might be due to that electronic mind maps as a learning tool is valuable and enjoyable in learning for nursing students than traditional method.

## Conclusion

The study concluded that the electronic mind map strategy enhanced nursing students' academic achievement, vitality, and self-efficacy when compared to the traditional approach based on the test scores. Also, there were highly statistically

significant differences between mapping group and conventional group in satisfaction level after intervention. Thus, it was confirmed that e-mind maps are effective and powerful tool for teaching and learning nursing courses.

## Recommendations

Based on study results, the following recommendations were suggested:

- 1) Mind-mapping learning technique should be implemented as an effective and acceptable teaching for nursing students' education.
- 2) Offering training courses on the newest technology-based teaching techniques to the academic staff. The e-mind mapping technique must be the focus of this training program.
- 3) Further studies are required to examine effectiveness of e-mind maps in long-term retention of information, and its impact on the utilization of the needed information in practice.

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