Effect of Electronic Mind Map on Nursing Students' Clinical Judgment Skills

Eman Mohammed Rashad Ahmed Behiry, Assistant lecturer

Nursing Education, Faculty of Nursing, Damanhur University

Eman Elsayed Taha, Professor

Nursing Education, Faculty of Nursing, Alexandria University

Ghada Elsayed Abdelhalim, Assistant Professor

Nursing Education, Faculty of Nursing, Alexandria University

Abstract:

Background: *Mind mapping is a powerful teaching and learning approach for connecting theory and practice and making the nursing process easier which is one of the most important goals of nursing education. As a result, there is a need in nursing education to improve nursing students' clinical judgment skills on a national and global scale. Nursing educators should develop learning strategies that are competency-based rather than time-based to empower nursing students' academic and practical skills. Many strategies, including mind mapping, can improve clinical judgment skills and encourage meaningful learning.* ***Objective****: The aim of this study was to determine the effect of electronic mind map on nursing students' clinical judgment skills.* ***Setting:*** *This study was carried out at Medical-Surgical Nursing Department, Faculty of Nursing, Damanhour University.* ***Subjects:*** *the study subjects comprised 60 nursing students who were randomly assigned into two equal groups study and control, (30) students each.* ***Tools:*** *Clinical Judgment Skills Rubric (CJSR) and Electronic Mind Map Scoring Rubric were used as tools for data collection.* ***Results:*** *The findings of the present study revealed that there was a statistically significant difference between the study and the control group after using the E-Mind Map in relation to their clinical judgment skills (p = 0.000). Furthermore, the mean change and standard deviation of clinical judgment skills in the study group were reported as 18.17±2.49, while in the control group was 3.43±2.11. There is a high positive correlation between the mean score of the mind map and the clinical judgment skills among the study group over the course of the intervention.* ***Conclusion:*** *In conclusion, the findings of the present study support the hypothesis that nursing students who utilize electronic mind map exhibit higher clinical judgment skills levels than those who do not.* ***Recommendations:*** *Electronic mind mapping strategy should be integrated into the curriculum and online courses and nursing students should be provided with the appropriate infrastructure and updated resources to support the successful electronic mind map strategy implementation.*

Key words: Electronic Mind Map (EMM), Clinical Judgment Skills (CJS), Nursing Process.

Introduction

Clinical judgment, problem solving, decision-making, and critical thinking are commonly used interchangeably. The broadest of these concepts is critical thinking, which describes the use of thinking skills and attitudes to make decisions based on relevant data (Kassaman & Corlett, 2019). Clinical reasoning entails the collection, analysis, and evaluation of information, as well as making of appropriate judgments.

Clinical judgment is even more limited, requiring the generation, evaluation, and prioritization of potential alternatives, as well as the selection of different courses of action. These processes together, lead to competent nursing practice (Mariani et al., 2018).

Additionally, Clinical judgment skills (CJS) are critical for nurses in today's nursing area. It is the relationship between nursing knowledge and how that knowledge applied through intervention, management, and evaluation. So, the opportunities should be provided for the students to think critically and make independent decisions in a safe environment (Sherrill, 2020).

Many strategies, such as the flipped classroom, simulation-based learning, and mind mapping, can improve CJS and encourage meaningful learning.

Mind mapping has been used in nursing as a novel-thinking tool that has been incorporated with teaching and learning in recent years. It is a strategy that combines drawings and words to create memory linkages between a topic keyword and an image, or other link (Mohammed et al., 2022).

Mind mapping highlights the contents' important points and allows learners to successfully store and extract information. It has been revealed as a training tool, that is not only improves learning efficiency but also increases learning motivation and interest (As' ari, 2016).

Mind mapping is also a powerful teaching and learning approach for connecting theory and practice and making the nursing process easier for students to be learned. Furthermore, one of the most important goals of nursing education is to improve students' understanding of the nursing process stages. In all stages of the nursing process, including the nursing care plan, effective problem solving requires critical thinking, and clinical judgment skills (Nibbelink & Brewer, 2018; Toney-Butler & Thayer, 2022).

Therefore, students should be guided to understand patient needs, develop appropriate responses and adjust care plans based on clinical reasoning and judgment. As the widely used nursing process model of practice has become synonymous with clinical judgment (Van Graan et al., 2016; Guerrero, 2019).

Mind mapping is known to be a useful method for improving students' cognitive capacities and promoting higher order thinking abilities such as clinical judgment skills across a range of subject areas. Therefore, the researcher's point of interest is to teach nursing students how to make an electronic mind map (EMM) template, how to organize the patients' individualized and different data or problems in an EMM instead of the traditional method of the nursing care plan and determine its effect on their clinical judgment skills.

Aims of the study

This study aims to determine the effect of electronic mind map on nursing students' clinical judgment skills.

Research hypothesis:

Nursing students who utilize electronic mind map exhibit higher clinical judgment skills levels than those who do not.

Materials and Method

Materials:

Research design: A Quazi-experimental design was used in this study

Settings: This study was carried out at Medical-Surgical Nursing Department at the Faculty of Nursing, Damanhour University. In addition to, Damanhour Medical National Institute in which the nursing students were spent their clinical training.

Subjects: : The study subjects comprised 60 nursing students who were randomly assigned into two equal groups study and control, (30) students each.

Tools: the following tools were used to collect data in this study:

Tool I: Clinical Judgment Skills Rubric:

It was adapted by the researcher based on Lasater (2007) after approval for modification from the original author. It

was used to assess the four aspects of clinical judgment; noticing, interpreting, responding, and reflecting. It described the development of these aspects through ten clinical indicators which are;

- **Effective noticing** consists of two items; focused observation/information seeking and identifies deviations from expected patterns.
- **Effective interpreting** consists of two items; prioritizing data and making sense of data.
- **Effective responding** consists of four items; calm and confident manner, clear communication, well-planned intervention/flexibility and being skillful.
- **Effective reflecting** consists of two items; evaluation/self-analysis and commitment to improvement.

It was along a continuum from 1:4 where 1 = beginning, 2 = developing, 3 = accomplished, and 4 = exemplary. In addition to a sheet that contains the students' personal and academic characteristics such as name, code, age, sex, academic achievement in the first academic year.

The scoring system ranged from 10- 40 and categorized into three levels; high, moderate and low. The range from 10-20 represented low clinical judgment skills, the range from 21-30 represented moderate clinical judgment skills, and the range from 31-40 represented high clinical judgment skills.

Tool II: Electronic Mind Map Scoring Rubric:

This tool was developed by the researcher after an extensive review of the literatures (Cañas & Novak, 2014; Coutinho, 2014; Abd-Elhalem, 2016) to measure the performance of nursing students in constructing the electronic mind map. It composed of the criteria, the indicators, and the level of performance, the descriptor, and the score to evaluate the students' mind maps. Each criterion was classified into four levels of performance, which are excellent, very good, good and poor. The rubric included organization, comprehensiveness, links, accuracy, and attractiveness.

The scoring system ranged from 5-20, and was categorized into four levels excellent, very good, good and poor; the range from 5-8 represented poor MM map construction, the range from 9-12 represented good MM construction, the range from 13-16 represented very good MM construction and the range from 17-20 represented excellent MM construction.

Method:

Official permissions to conduct the study were obtained from the Dean, the head of Medical- surgical Nursing Department, and the head of Information Technology Unit of the Faculty of Nursing, Damanhur University.

Study tools were tested for its content validity by five experts in nursing education and medical-surgical departments, and then the necessary modifications were done.

Study tools were investigated for their reliability using Cronbach's Alpha test. The reliability coefficient for the tools (I), (II) was 0.76, and 0.71 respectively. A pilot study was carried out on 10% of the total subjects' size prior to the actual study.

Actual Study

This study followed three phases; preparation, implementation and evaluation.

Preparation Phase:

- The researcher prepared a PowerPoint presentation; small videos (capsules) and a case study for the study group training on writing a nursing care plan in the form of EMM.
- The researcher downloaded the free X-mind map program at the information technology laboratory (IT lap) where the students were trained.
- A channel on the Microsoft team was created and the researcher uploaded the PowerPoint presentation and videos on it for the study group.

Implementation Phase:

- The researcher explained the purpose of the study for both groups and illustrated the first tool items for the medical surgical department clinical instructor who was responsible for the control group evaluation.
- On the first clinical day of the urology rotation both groups were distributed randomly to dialysis patients who had the same diagnosis (renal failure) and were instructed to write their first nursing care plan individually by paper-based method .It was evaluated by using tool I(pretest).
- First, the researcher presented the PowerPoint presentation, the small videos for the study group and provided them with the case study data and teach them how to construct an electronic mind map.
- Then, on clinical days, both groups were distributed to the urology department patients randomly.
- The researcher observed and asked the study group about tool I items during their interaction with the patients by using tool I.
- Every student constructed one E-MM per week pertaining to the assigned patients (five electronic MMs per five weeks) in addition to one for posttest.
- On the last clinical day, both groups were assigned again for the first patient they deal with in the dialysis unit (in the first clinical day) and wrote their last nursing care plan for posttest.
- The study group wrote their last EMMs and the control group wrote their last paper-based plan.

Evaluation Phase:

- Every clinical day the study group received oral and written feedback as well as suggestions for improvement based on researcher evaluation of their MM content, their progress and the students' score in tool II through the Microsoft team channel.
- On the last clinical day, posttest were done for both groups by the evaluation of the last nursing care plan by using tool I for both groups and tool II for study group only.

Ethical considerations:

- A written informed consent was obtained from nursing students after explanation of the study aim.
- Confidentiality of collected data was ensured.
- Privacy of subjects was maintained.
- Subjects' participation was on voluntary basis and they have the right to withdraw at any time from the study.

Results

Table (1) shows the distribution of the study and control groups in relation to their personal and academic characteristics.

It can be seen that half of the study group compared to about nearly one third of the control group had twenty one years old. 43.33% of the study group compared to 63.30% of the control group had twenty years old. More than two thirds of the study group and more than half of the control group were females.

63.30% and 53.30% of the students in the study and control group had excellent as GPA in the previous year respectively, where 30% compared to 40% of the study and control group had very good as GPA in the previous year respectively.

Table (2) demonstrates comparison between the study and the control groups in relation to clinical judgment skills before and after the intervention.

Results of the present study reveal that 70 % of the study group compared to the 90 % of the control group had low clinical judgment skills before the application of EMM.

After the intervention it was noticed that all students in the study group had high clinical judgment skills compared to 60% of the control group had moderate clinical

judgment skills with a highly significant difference between both groups.

Table (3) illustrates comparison between the study and the control groups in relation to mean change of the clinical judgment skills before and after the intervention. It was observed that there was a statistical significant difference between the two groups before and after the application of EMM in relation to the clinical judgment skills P (0.000).

The progress in the state of the clinical judgment skills were in favor of the study group in contrast to the control group as the mean change and standard deviation of the clinical judgment skills was 18.17±2.49 among the study group, compared to 3.43±2.11 among the control group.

Table (4) illustrates mean changes of the clinical judgment aspects during the intervention among the study group.

This table shows that the mean and standard deviation of the four aspects of clinical judgment skills increased gradually during the application of EMM for the study group from the first week to the last one as follow; the noticing aspect (from 4.30± 0.60 to 7.17± 0.59), the interpreting aspect (from 5.70± 1.32 to 7.80± 0.41), the responding aspect (from 10.47± 1.66 to 14.40 ± 1.16) and the reflecting aspects(from 5.00± 1.36 to 7.03± 0.56) with a statistical significant difference in the clinical judgment mean score and standard deviation throughout the application of electronic mind map from 24.67± 2.81 to 36.40± 1.54 throughout the five weeks of application.

Table (5) shows mean ± standard deviation of the clinical judgment aspects during the intervention among the control group.

This table reveals that there was no obvious change in the mean score and standard deviation of the noticing or interpreting aspect throughout the time of the study for the control group but there was slightly change in the mean score and standard deviation of the responding and reflecting aspects from the first week to the last one as follow (from 9.10±1.16 to 9.63± 1.50 and from 2.77±1.17 to 3.33± 1.54 respectively) with slightly change in the mean scores and standard deviation of the clinical judgment total score (from 18.40±2.28 to 20.17± 2.74) throughout the weeks of the study.

Table (6) illustrates mean of the electronic mind map aspects from the first week to the last one among the study group.

This table shows that the electronic mind map five aspects mean score and standard deviation improved also from the first week to the last one; organization (from2.70±0.60 to 3.97± 0.18 comprehensiveness (from 2.63± 0.72 to 4.00 ± 0.00).

Regarding the usage of links in EMM the mean score and standard deviation increased (from 2.57± 0.57 to 3.70± 0.47) which similar to the increased in the EMM attractiveness (from 2.67± 0.76 to 3.87± 0.35) and the accuracy increased (from 3.23± 0.43 to 4.00± 0.00) with a statistical significant difference in the electronic mind map totally mean score (from 13.80 ± 2.09 to 19.53± 0.73).

Discussion

The preliminary assessment of the current study before implementing electronic mind map found that there are no significant differences between the study and the control group in terms of all personal and academic parameters. These findings imply that the study groups were well matched.

The study's findings show that, there was a significant difference in **mean scores of the four aspects of clinical judgment in the study group** before and after the intervention and consequently in the clinical judgment skills totally mean score which increased progressively from the first week to the last week.

Concerning **the control group**, the results show that there were no significant changes in the mean scores of the **noticing and interpreting aspects** over the course of the study. However, the mean scores of the **responding and reflecting aspects** progressed slightly which may be due to the fact that nursing students' exposure to various patients with different diagnoses and writing nursing care plans multiple times which made them more experienced, promoted their ability to respond appropriately and encourage them to engage in self-reflection.

Regarding the study group, these findings can be attributed to the unique benefits and merits of electronic mind map in promoting information organization and clinical judgment skills. These are in line with a systematic review by (Wu & Wu, 2020) and the study of (Hazaymeh & Alomery, 2022) which highlighted the positive effects of visual tools, including mind map, in promoting critical thinking and clinical judgment skills among nursing students.

In relation to **effective noticing,** the present study results were consistent with (Uppor et al., 2022), study which found a substantial difference between the research groups in relation to assessment phase of the nursing process after employing the mind map.

These findings could be attributed to the fact that MM helped the students in taking patients' history and performing physical examination. It was useful for the students to gather a wide range of subjective and objective data from patients, relatives, sheets, staff, and instructors which are needed for a comprehensive patient evaluation.

Regarding **the effective interpreting,** the present study findings are consistent with the studies of (Kaddoura et al., 2016), (Andrade, 2019), (Luangapichart et al., 2022), which found that the majority of participants reported that using mind map boosted their ability to focus on the most important information, construct a plan of care based on the mind map information and developing ideas for data prioritization.

These findings may be linked to the fact that EMM templates had distinct branches for different concepts or ideas, allowing the students to connect these branches and ideas depending on each other in order to distinguish which problem to be written first, which will be written later, which can be written alone or which depended on another one.

It assists the students in reorganizing their ideas, and then prioritizing patients' actual and potential problems, developing the appropriate nursing diagnosis related to each patient's specific medical condition, setting measurable and observable nursing goals for each nursing diagnosis, and developing successful intervention plans based on patients' individual differences.

In relation to **the effective responding**, these findings are in consistent with the researches of Abbas et al. (2019), and Kwame and Petrucka (2021)that showed that visual tools, such as mind map improved communication skills, reduced tension or anxiety in nursing students and helped in greater planning and flexibility in writing nursing interventions.

Adding to that, it had a significant impact on improving the overall skillfulness of the study group, possibly by improving their ability to understand patients' problems, applies clinical knowledge and selects the most appropriate basic care.

These findings may be attributed to the fact that MM improves the organization, presentation and retrieval of information in a clear manner, which consequently reflected on the study group self-assurance capacity to engage calmly, confidently and communicate effectively.

Concerning **the effective reflecting**, these results are in the same line with the studies of Mohaidat (2018), and Pang

(2022), which indicated that electronic mind map was a beneficial learning method in improving the study group's ability to critically examine their own performance and engage in self-reflection, develop auto-monitoring strategies and self-appraisal of their own particular thinking process, hence enhancing their clinical judgment skills.

These findings may be attributed to the fact that the study group used MM to express and represent their thoughts and ideas and then it was submitted to the researcher and to each other to discuss their opinions or perspectives and provide feedback in a non-judgmental manner, as the consistent and timely feedback promotes excellent practice and drives the learner to achieve the desired outcome.

In addition to that, after students' complete clinical hours with patients, the researcher interviewed and discussed with each student individually the strength and weakness points that encountered during interaction with the patient.

In consistence with the present findings, the studies of Al-Zyoud et al. (2017), and Sari and Murdiono (2021), indicated that mind map training increases learners' organizational capacities and performance. The study findings of Ashipala et al. (2023), found that nursing students used electronic mind map to build visual representations of patient comprehensive data and allowing them to gain a better grasp of the interconnection of nursing care.

This is consistent with Kalyanasundaram et al. (2017), whose study findings found that mind map promoted students' ability to include links between various aspects. El-Sayed et al. (2023), their studies found that mind map helped students to accurately synthesize and comprehend information.

Regarding the present study several variables can be linked to the observed improvement. As the study group acquired expertise with practice, they got more proficient in utilizing the features and strategies of EMM.

As students were acquainted with the program and its functions, weekly MM practice with the researcher's meetings and peer critique all aided in the steady growth and refinement of participants' EMM skills.

These concerns were investigated by Erdem (2017), in a study centered on university students' impressions of the usage of mind map as a lifelong learning tool, which revealed that when students continued to construct MMs, they became faster and more skillful and creative.

The previous results indicate a high positive correlation between the mean score of the mind map and the **clinical judgment skills** among the study group. Therefore, the research hypothesis was accepted.

Conclusion

It can be concluded that the Electronic Mind mapping is a useful and effective educational technique that helps in improving nursing students clinical judgment skills. It is also well accepted by students and provided them with more satisfying learning experiences. It promotes students' active engagement in the process of brainstorming, developing ideas, and connecting concepts together while constructing and reviewing it.

Recommendations

Based on the findings of the current study, the following recommendations have been generated:

- Provide nursing students with the appropriate infrastructure and updated resources to support the successful EMM strategy implementation and educational process.
- EMM strategy should be integrated into the curriculum and online courses.
- Evaluation of the effect of electronic mind map strategy on nursing students' knowledge retention and academic achievement.

Table (1): Distribution of the study and control groups in relation to their personal and academic characteristics (no=60).

Personal and academic characteristics	Study group (n =30)		Control group (n =30)		Test of sig.	P
	No.	%	No.	%		
Age [years]					3.958	0.266
19	1	3.33	2	6.70		
20	13	43.33	19	63.30		
21	15	50.00	9	30.00		
22	1	3.34	0	0.00		
Min. – Max.	22-19					
Mean ± SD.	20.38±0.61					
Sex					1.832	0.176
Male	8	26.70	13	43.30		
Female	22	73.30	17	56.70		
Academic achievement					3.541	0.170
Excellent	19	63.30	16	53.30		
Very good	9	30.00	12	40.00		
Good	2	6.70	2	6.70		

Test of sig:Chi-square test * Statistically significant p-value at ≤.05

Table (2): Comparison between the study and the control groups in relation to clinical judgment skills score before and after the intervention.

Clinical judgment skills	Before		After	
	Study	Control	Study	Control
	No %	No %	No %	No %
Low	21(70%)	27(90%)	0(0%)	12(40%)
Moderate	9(30%)	3(10%)	0(0%)	18(60 %)
High	0(0%)	0(0%)	30(100%)	0(0%)
FEP	**3.750(0.104)**		**60.000*(0.000)**	
Mean±SD	**19.57±2.76**	**17.90±2.29**	**37.73±1.28**	**21.33±2.84**
t (P)	**2.542(0.014)***		**28.779(0.000)***	

Test of sig:Chi-square test Test of T Independent semple test * Statistically significant p-value at ≤.05

Table (3): Comparison between the study and the control groups in relation to the mean change of the clinical judgment skills before and after the intervention.

Clinical judgment skills	Study		Mean Change ± SD	Control		Mean Change ± SD
	Before	After		Before	After	
Minimum	15.00	34.00	18.17±2.49	13.00	17.00	3.43±2.11
Maximum	25.00	40.00		23.00	26.00	
Mean	19.57	37.73		17.90	21.33	
SD	2.76	1.28		2.29	2.84	
t (P)	39.921*(0.000)			8.904*(0.000)		

T Paired simple test * Statistically significant p-value at ≤.05

Table (4): Mean of the clinical judgment aspects during the intervention among the study group.

Clinical judgment aspects	1st week	2nd week	3rd week	4th week	5th week	F
	Mean± SD	Mean± SD	Mean± SD	Mean± SD	Mean± SD	(P)
Noticing	4.30± 0.60	5.73± 1.20	6.73± 0.94	7.03± 0.89	7.17± 0.59	134.39 (0.000)*
Interpreting	5.70± 1.32	6.83± 1.42	7.57± 0.63	7.70± 0.47	7.80± 0.41	124.72 (0.000)*
Responding	10.47±1.66	12.13±1.48	13.33±1.24	14.00±1.23	14.40±1.16	143.31 (0.000)*
Reflecting	5.00± 1.36	5.87± 1.07	6.60± 0.62	6.83± 0.70	7.03± 0.56	68.26 (0.000)*
Clinical judgment	24.67±2.81	30.57±3.30	34.23±2.03	35.57±2.08	36.40±1.54	424.15 (0.000)*

(F) Repeated Measure ANOVA * Statistically significant p-value at ≤.05

Table (5): Mean of the clinical judgment aspects during the intervention among the control group

Clinical judgment aspects	1st week	2nd week	3rd week	4th week	5th week	F (P)
	Mean± SD	Mean± SD	Mean± SD	Mean± SD	Mean± SD	
Noticing	3.63± 0.67	3.67±0.66	3.37± 0.49	3.63±0.81	3.43± 0.50	**4.05 (0.001)***
Interpreting	3.07±0.91	3.07±0.91	3.77± 0.68	3.50±0.63	3.77± 0.68	**8.36 (0.000)***
Responding	9.10±1.16	9.00 ±1.20	9.63± 1.45	9.23±1.38	9.63± 1.50	**18.06 (0.000)***
Reflecting	2.77±1.17	2.87±1.20	3.30± 1.53	3.27±1.44	3.33± 1.54	**5.76 (0.000)***
Clinical judgment	18.40±2.28	18.60±2.47	20.07±2.63	19.63±2.95	20.17±2.74	**28.51 (0.000)***

(F) Repeated Measure ANOVA * Statistically significant p-value at ≤.05

Table (6): Mean of the E-mind map aspects from the first week to the last one among the study group

E-mind map aspects	1st week	2nd week	3rd week	4th week	5th week	Last week	F
	Mean± SD	Mean± SD	Mean± SD	Mean± SD	Mean± SD	Mean ± SD	(P)
Organization	2.70±0.60	3.40±0.67	3.73±0.52	3.87±0.35	4.00±0.00	3.97±0.18	**42.29 (0.000)***
Comprehensiveness	2.63±0.72	3.50±0.68	3.77±0.43	3.70±0.47	3.83±0.38	4.00±0.00	**31.36 (0.000)***
Links	2.57±0.57	3.20±0.55	3.17±0.59	3.37±0.49	3.63±0.49	3.70±0.47	**24.20 (0.000)***
Accuracy	3.23±0.43	3.47±0.51	3.70±0.47	3.77±0.43	3.90±0.31	4.00±0.00	**16.81 (0.000)***
Attractiveness	2.67±0.76	3.00±0.69	3.37±0.61	3.63±0.49	3.60±0.50	3.87±0.35	**19.60 (0.000)***
E-mind map	13.80±2.09	16.57±2.06	17.73±1.48	18.33±1.12	18.97±0.85	19.53±0.73	**76.53 (0.000)***

(F) Repeated Measure ANOVA * statistically significant p-value at ≤.05

References:

- Abbas, J., Aman, J., Nurunnabi, M., & Bano, S. (2019). The impact of social media on learning behavior for sustainable education: Evidence of students from selected universities in Pakistan. *Sustainability, 11*(6), 1683. https://doi.org/10.3390/su11061683.
- Abd-Elhalem, G. (2016). *Effect of Using E-Mind Maps on Clinical Reasoning and Knowledge among Critical Care Nursing Students* [Doctorate Thesis]. Faculty of Nursing, Alexandria University.
- Al-Zyoud, A. A., Al Jamal, D., & Baniabdelrahman, A. (2017). Mind mapping and students' writing performance. *Arab World English Journal Volume, 8*(4), 280-291. https://doi.org/10.24093/awej/vol8no4.19.
- Andrade, C. (2019). The P value and statistical significance: misunderstandings, explanations, challenges, and alternatives. *Indian Journal of Psychological Medicine, 41*(3), 210-215. https://doi.org/10.4103/IJPSYM.IJPSYM_193_19.
- As' ari, A. (2016). Using mind maps as a teaching and learning tool to promote student engagement. *Loquen, 9*(01), 1-10. https://doi.org/10.32678/loquen.v10i01.25.
- Ashipala, D. O., Elias, S., & Lifalaza, A. (2023). Nursing students' experiences of utilizing a concept map as a learning method in human anatomy and physiology: A qualitative descriptive study. *International Journal of Africa Nursing Sciences, 18*, 100547. https://doi.org/10.1016/j.ijans.2023.100547.
- Cañas, A. J., & Novak, J. D. (2014). Concept Mapping Using CmapTools to Enhance Meaningful Learning. In A. Okada, S. J. Buckingham Shum & T. Sherborne (Eds.), *Knowledge Cartography: Software Tools and Mapping Techniques* (p.p. 23-45). Springer London.
- Coutinho, E. (2014). Concept maps: Evaluation models for educators. *Journal of Business and Management Sciences, 2*(5), 111-117. https://doi.org/10.12691/jbms-2-5-4.
- El-Sayed, N. M., Abdel-Azeem, A. M., & Abd El-Aziz zaki, A. K. (2023). The Effect of Mind Mapping on Cognitive Achievement and Critical Thinking skills of Nursing Students. *International Egyptian Journal of Nursing Sciences and Research, 3*(2), 685-703. https://doi.org/10.21608/ejnsr.2023.278221.
- Erdem, A. (2017). Mind Maps as a Lifelong Learning Tool. *Universal Journal of Educational Research, 5*(n12A), 1-7.
- Guerrero, J. G. (2019). Practice rationale care model: The art and science of clinical reasoning, decision making and judgment in the nursing process. *Open Journal of Nursing, 9*(2), 79-88. https://doi.org/10.4236/ojn.2019.92008.
- Hazaymeh, W. A., & Alomery, M. K. (2022). The effectiveness of visual mind mapping strategy for improving English language learners' critical thinking skills and reading ability. *European Journal of Educational Research, 11*(1), 141–150. https://doi.org/10.12973/eu-jer.11.1.141.
- Kaddoura, M., Van-Dyke, O., & Yang, Q. (2016). Impact of a concept map teaching approach on nursing students' critical thinking skills. *Nursing & Health Sciences, 18*(3), 350-354. https://doi.org/10.1111/nhs.12277.
- Kalyanasundaram, M., Abraham, S. B., Ramachandran, D., Jayaseelan, V., Bazroy, J., Singh, Z., & Purty, A. J. (2017). Effectiveness of mind mapping technique in information retrieval among medical college students in Puducherry-A pilot study. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine, 42*(1), 19. https://doi.org/10.4103/0970-0218.199793.
- Kassaman, D. M., & Corlett, J. (2019). From a nursing diploma to a bachelor's degree: critical thinking. *Africa Journal of Nursing and Midwifery, 21*(1), 16. https://doi.org/10520/EJC-181ad51165.
- Kwame, A., & Petrucka, P. M. (2021). A literature-based study of patient-centered care and communication in nurse-patient interactions: barriers, facilitators, and the way forward. *BMC nursing, 20*(1), 1-10. https://doi.org/10.1186/s12912-021-00684-2.

- Lasater, K. (2007). Clinical judgment development: using simulation to create an assessment rubric. *The Journal of nursing education*, *46*(11), 496-503. https://doi.org/10.3928/01484834-20071101-04.
- Luangapichart, P., Saisavoey, N., & Viravan, N. (2022). Efficacy and Feasibility of the Minimal Therapist-Guided Four-Week Online Audio-Based Mindfulness Program ‘Mindful Senses’ for Burnout and Stress Reduction in Medical Personnel: A Randomized Controlled Trial. *Healthcare*, *10*(12). doi:https:// 10.3390/healthcare10122532.
- Mariani, B., Fey, M. K., & Gloe, D. (2018). The simulation research rubric: a pilot study evaluating published simulation studies. *Clinical Simulation in Nursing*, *22*, 1-4. https://doi.org/10.1016/j.ecns.2018.06.003.
- Mohaidat, M. M. T. (2018). The Impact of Electronic Mind Maps on Students' Reading Comprehension. *English Language Teaching*, *11*(4), 32-42. https://doi.org/10.5539/elt.v11n4p32.
- Mohammed, B. M. A., Heggy, E. H. Y., Ahmed, H. F. I., Khalil, N. H. K., & Elesawy, F. M. (2022). Effect of Mind Map Using on Improving Nurses' Performance Regarding Infection Control at Surgical Departments. *Egyptian Journal of Health Care*, *13*(1), 958-976.
- Nibbelink, C. W., & Brewer, B. B. (2018). Decision-making in nursing practice: An integrative literature review. *Journal of Clinical Nursing*, *27*(5-6), 917-928. https://doi.org/10.1111/jocn.14151.
- Pang, N. S. (2022). Teachers' reflective practices in implementing assessment for learning skills in classroom teaching. *ECNU Review of Education*, *5*(3), 470-490. https://doi.org/10.1177/2096531120936290.
- Sari, R. A., & Murdiono, M. (2021). The Effect of the Implementation of Mind Mapping Method on Critical Thinking Skills in Civic Education Learning. *Jurnal Pendidikan Indonesia*, *10*(3), 505-515. https://doi.org/10.23887/jpi-undiksha.v10i3.30555.
- Sherrill, K. J. (2020). Clinical judgement and next generation NCLEX®–A positive direction for nursing education! *Teaching and Learning in Nursing*, *15*(1), 82-85. https://doi.org/10.1016/j.teln.2019.08.009.
- Toney-Butler, T. J., & Thayer, J. M. (2022). *Nursing process*. Treasure Island (FL): StatPearls Publishing.
- Uppor, W., Klunklin, A., Viseskul, N., & Skulphan, S. (2022). A concept analysis of clinical judgment in undergraduate nursing students. *Nursing forum*, *57*(5), 932-937. https://doi.org/10.1111/nuf.12757.
- Van Graan, A. C., Williams, M. J. S., & Koen, M. P. (2016). Professional nurses' understanding of clinical judgement: A contextual inquiry. *Health Sa Gesondheid*, *21*, 280-293.
- Wu, H. Z., & Wu, Q. T. (2020). Impact of mind mapping on the critical thinking ability of clinical nursing students and teaching application. *Journal of International Medical Research*, *48*(3), 1-8. https://doi.org/10.1177/0300060519893225.