

Examining the student and teacher feedback on concept mapping as a teaching and learning method

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Abstract

Background: Nursing students struggle to link theory to practice; therefore, nurse educators are requested to use innovative methods to help them in this regard such as the concept mapping. Purpose: to examine the effectiveness of concept mapping as a teaching learning method in clinical setting. Method: A mixed method approach was used to student nurse and educators. A Likert scale of 15 items with 4 open ended questions was used to assess the effectiveness of the method in improving the students' care plan. For qualitative, teacher' reflection was used to assess the teacher perception about the effectiveness of concept map as a teaching learning method. Results: This study indicated concept mapping is an effective method in teaching in clinical setting, developing appropriate care plan and promoting critical thinking. The result showed that there is significant difference between the mean scores of participants in relation to critical thinking and usage of concept map in clinical setting, however there was no difference in regards of usage of concept map in developing care plan. Conclusion: Nurse Educators should consider the use of concept mapping as a way of teaching and learning process in order to improve critical thinking and quality of care.

Keywords: Concept Mapping; Critical Thinking; Evaluation Tool; Student Nurses; Teaching Method.

1. Introduction

Nursing students in UAE usually struggle to develop an accurate nursing care plan in their first, second and sometimes third year of their nursing study. The reason is that they are not able to link theory to practice as observed by the researcher and tutors' clinical evaluations. This could be related to teaching and learning method that the students were used in their secondary degree which focuses on lecture and encourage memorization [1] instead of being self-director learner. However, the teaching and learning process vary from degree to another and from school to another.

1.1. Educational system in UAE

UAE is a young country has grown and developed rapidly after the discovery of oil. Many changes have been introduced in the country from infrastructure, economy and education in order to keep abreast with globalization and technology. However, this created a challenge mainly for educators to prepare students to meet the demands of the new reform especially after looking closely to educational system in UAE. The educational system in UAE varies from primary and secondary in comparison to higher education, for instance the primary and secondary education uses mainly traditional method for teaching such as lecture, however the higher education is more directed toward use of technology and focus on self-directed learning, where collaborative learning and case studies and reflection are used [2,3]. Most common teaching practice in UAE in primary and secondary schools uses traditional lecture method, where the teacher uses most of the time lectures to cover certain topic. In order for students to have high scores, they should possess the ability to memories the material. However, science topic and mainly in medical and nursing field need a student to pose the quality of understanding and critical analysis in order to provide the appropriate care for patient complex situation. In 2004, UAE schools started the use of technology under the instructions of Sheikh Nahyan bin Mubarak Al Nahyan, Minister of Education, as a new way of educational approach, considering the learner as the center of the educational process [2]. This necessitated the implementation of new curriculum and teaching methods, which focus on active learning, self-learning and creativity.

2. Concept mapping and innovation in teaching and learning

According to Promethean (2022) Concept mapping is an easy-to-implement and effective teaching strategy that can help students better comprehend and understand course content [4]. Rather than simply memorizing facts, concept mapping enables students to build on and

integrate new concepts and ideas into an established cognitive framework. To keep abreast with technology, complexity of patient condition, continuous evolving and changing environment, and vast new amount of knowledge of diseases, a new teaching learning strategy should be used in order to prepare new nurses to adjust with these changes. Therefore, nurse educators are requested to use innovative teaching learning strategies to promote effective learning especially in clinical setting. Nurse educators face such challenges with lot of concern in how to prepare confident nurses that can adjust and maintain the positive attitude of learning and growing. Concept map can help nurse educators in this regard by its historical background as a powerful teaching learning method used in clinical setting to promote meaningful learning. Usefulness of concept map in clinical setting is based on the fact that it forces learner to analyze data, determine the relationship between concepts and identify the appropriate nursing intervention related to patient problem. In general, it is almost more than 30 years that concept mapping is being used by educators for teaching and learning and its usage evolved and developed to include many domains other than science health. The importance of concept map lies on the fact that way information is connected and presented to provide new meaningful knowledge. Historically, it was developed in 1970's by Novak as a way to enhance science teaching [5]. It has subsequently been used as a tool to increase meaningful learning [6]. Literature review represents many advantages and usage of concept map such as a way to promote critical thinking [7], [8]. Garwood et al., indicate the importance of using concept map in nursing to help students to correlate theory to practice [9]. Moreover, promote effective learning in nursing students' strategy for adult learning [10] above all it stimulates students' participation in their learning [11] and reduces the reliance on passive learning.

3. Method

The aim of this study is to examine the effectiveness of concept mapping as a teaching and learning method in clinical setting. The researchers used concept map as a teaching strategy in the clinical setting to assess student ability to discuss and analyze the patient condition.

3.1. The research questions for this study were:

- What is the students' perception about concept mapping?
- What was the teachers' reflection about the students' use of concept mapping?

3.2. Null hypotheses

- There is no difference between class level's perceptions in regard to usage of concept mapping.
- There is no difference between class level and critical thinking concept.
- There is no difference between Nursing care plan and class level.

3.3. Design: sequential explanatory design

This research utilized mixed methods sequential explanatory design. The design incorporated both qualitative and quantitative method. The quantitative research conducted through questionnaire distributed to students. The qualitative data included the open-ended questions from students and teacher reflection.

3.4. Data analysis procedure

Descriptive statistical analysis was used to analyze the results of this study, such as frequencies, means, and standard deviations were calculated to identify the difference between the students' perception. As well as t-test for independent sample was used to compare between DII and DIII. Content analysis were used to identify the themes regarding to effectiveness of use of concept map (CM) on care plan and teachers' feedback.

3.4.1. Sample setting

A purposive sample was used including the second- and third-degree nursing diploma students doing their practicum in clinical placement included pediatric and obstetrics and gynecology ward. 42 nursing students agreed to participate in this study, 24 from DII and 18 from DIII. The study was conducted through 10 weeks in the clinical area (2 days per week).

3.5. Ethical consideration

Approval was granted as a type of educational objective to improve students' performance in clinical area. At the time of the study, there was no established ethics board. The students were informed about the purpose of study and were reassured about confidentiality throughout the study. Consent was considered granted after the survey was sent back.

3.6. Instrument

A questionnaire consists of 15 items were developed by researcher from literature review to evaluate the students, perception about the concept map. The questionnaire checked for face and content validity with group of 5 clinical educators and its reliability scored of 0.91 of Cronbach's alpha.

The questionnaire used to measure student's perception consists of 15 items ranged from 5 for strongly agree to 1 strongly disagree.

3.7. Data collection process

The procedure for developing care plan through use of concept map method in clinical setting started when students were given instructions in the class in how to develop concept map and were asked to work as a group during the first experience with concept map. After 10 weeks of using concept maps, students were asked to evaluate usefulness of concept as teaching method by completing a questionnaire. At

the same time faculty were asked to provide a reflection about the effectiveness of concept map on the teaching method in the clinical setting. In preparation for concept map construction students were lectured about concept map for one hour. A case scenario was used and incorporated to formulate a concept map. An explanation was given about how the concepts were linked. Following explanation and demonstration, the students were divided into small group and a new case scenario was given to whole class in order to allow them to practice the application of concept map. The researcher was present in addition to another experienced faculty to guide students when needed. Guidelines were given to consider the patient at the center and all the problems surround it; this to allow the students to visualize the patient holistically. In each problem the students were asked to identify the patient subjective and objective data that relate to a specific problem, then they were asked to find out the medication and lab results that are related to that specific problem. The information that does not fit were asked to place outside the patient problem and place it in certain box. A question mark (?) was placed above the box, which acted as a sign to remind the students to think and find out where it can fit. The students were encouraged to check the box in between to see where the data can fit with other problems. Such an action supports the critical thinking and metacognition.

The students were asked to read and find out where such data can fit; after that they were asked to priorities the problems and were encouraged to support their finding.

At the beginning of the clinical rotation, the students were asked to submit a concept map with each time they submit their care plan. To make it more realistic the instructor choose one case in the clinical setting and showed the students how to collect the data, do physical assessment, then went out of the room and asked the students about the problems the patient was exhibiting and sat with them to discuss the problem and priorities it. The researcher informed the students to put the patient in the center and all problems surround it following the guidelines that was discussed in the class. After that showed them how the subjective and objective data are correlated to patient condition and finally the problems were prioritized. During the first two weeks of the orientation students were given the chance to read about one case, do assessment for patient in presence of clinical instructor and one of her colleagues after taking permission of the patient. Then asked them to find the solution to problem by relating it to certain medication or intervention that supports the problem. After the problems were identified, they were asked to put it in priority.

4. Results

4.1. Demographic

Table 1: Socio-demographic Information of DII and DIII Participants (N=42)

Item	DII	DIII
Class	24(57%)	18(43%)
Gender: Female	24(100 %)	18(100%)
Mean Age	20.12+ _{2.61}	22.4+ _{3.10}
Marital status	24(100%)	16(88 %)
Single	0%	2(12%)
Married		

Of the 42 students 24(57%) were DII and 18(43%) were DIII, the mean age was 20+₂ for DII and DIII 23+₃. All of them were female and 100% single in DII and 12% were married in DIII (Table 1).

4.2. Perception about concept map

The perception of students about the concept map was measured by 5-point Likert scale. The participants were asked to identify to what extent they agreed or disagreed with various statements regarding perceptions about concept map as presented in Table 2.

Almost 71% DII indicated that concept map helped them in doing proper assessment compared to 39 % from DIII. Sixty six percent (66%) from DII also indicated that concept map helped them to prioritize their care plan compared to half of DIII students (50%).

All the mean scores are higher in DII than in DIII in favor for concept map use except for item 14 and 15. Where DIII indicated that concept is difficult to follow (2.72) and is difficult to implement (2.66), while DII students rated 2 for disagree in regards of difficulty in constructing mind map or and 3 for difficult to implementing. The standard deviation for the items in DII ranged from 0.64 to 0.95, however for DIII from 0.97 to 1.32. This indicate DII students have similar, close opinion in regard to their positive satisfaction of concept map, however DIII, seems their opinion varies from positive to neutral answer, which indicate that some students are not much confident with the use of the concept map as compared to others.

In general, it seems DII students found concept map is more beneficial for them compared to DIII. For instance, DII rated 5(for strongly agree) that concept map guide and assist them to get relevant information, help them to relate information in proper fashion and prioritize their care plan. Moreover, the students indicated that it helps them in implementing appropriate care based on the previous knowledge. However, both groups rated "4 for agree" that concept map help them develop critical thinking, reducing their anxiety during evaluation and assess their previous knowledge.

Table 2: Students' Perception about Concept Map (N=42)

Conceptual map	DII				DIII			
	Mean	SD	%	F	Mean	SD	%	F
guides me to conduct proper assessment for my patient	4.62	0.64	70.8	17	4.11	1.02	38.9	7
assists me to select relevant information from books.	4.45	0.65	54.2	13	4.00	1.02	38.9	7
helps me to relate relevant information to patient care.	4.58	0.58	62.5	15	4.11	1.27	50	9
guides me to prioritize my care plan.	4.54	0.72	66.7	16	4.27	1.01	50	9
helps me to implement proper care plan for my patient	4.70	0.69	79.2	19	4.22	1.00	44.4	8
helps me to build on previous knowledge	4.37	0.64	45.5	11	3.88	1.23	44.4	8
helps me to improve my care plan.	4.66	0.70	75	18	4.33	0.97	50	9
helps me to improve my level of performance	4.50	0.78	62.5	15	4.16	0.98	50	9
helps me in completing my log	4.70	0.69	79.2	19	4.38	1.03	61.1	11
teaches me on how to identify relationship among information gathered	4.58	0.65	66.7	16	4.11	1.32	55.6	10
Is a good method to evaluate my background knowledge	4.25	0.94	50	12	3.83	1.24	38.9	7
reduces my anxiety when discussing patient care plan with my tutor.	4.41	0.88	62.5	15	3.83	1.29	38.9	7
is a good method to develop my critical thinking.	4.54	0.77	66.7	16	3.94	1.21	50	9

Is difficult to follow	2.16	0.91	62.5	15	2.72	1.27	38.9	7
Is difficult to implement.	2.04	0.95	48.5	14	2.66	1.32	27.8	5

4.3. Students' views about concept map

Three open ended questions were used to identify about students views about the concept map. The first question "required from student to mention what they liked most about the conceptual map. The students' answers were mainly positive, and three themes were identified 'organize, Nursing care plan (NCP) and Critical thinking'. In regard to organization one student mentioned "...it organizes my work and organize our idea; other students commented. "it makes me more organized in my clinical work, so when I make concept map I know what I want and [how] it should be, however when I do not do concept map I feel confused and my time is wasted [for not doing the right thing]" ,in this statement it represents the confidence that the students gained knowledge when she used concept map; this supports Hill' (2006) viewpoints in regards to concept map[12]. For nursing care plan students indicated "Prioritize NCP [nursing care plan]" , easy to formulate ND [nursing Diagnosis]", and 'chose proper ND and easy to write log". Critical thinking process was well described by students as one of them indicated "... Correlate information, help me to correlate S&S [signs and symptoms] and ND and make work on finding the appropriate intervention, make link between theory with practice, help me to do critical thinking; it helps me to think about the data I collected". Another student added '[it] gives me clear picture about my patient care' and concluded by another student "we use all information we got from the patient file such as diagnostic studies and medication and help me to assess and implement patient care'. The second question asked student what they disliked most about concept map. The answer to this question showed dominance of positive attitude to negative attitude toward conceptual map. The majority of students from DII and DIII stated "nothing", however there were two negative themes "difficult and time consuming" as two students from DIII, mentioned "everything is difficult", and three students from DII mentioned "it takes time to implement". It seems these students have problem in correlating concepts as indicated by them. One student mentioned "how to relate everything to cause and I do not know everything" another two students indicated "it is difficult to correlate information". All of that indicate students are different and they learn in different pace. The third question asked student "if they recommend using concept map in clinical area and why". Majority of students from DII, recommend using concept map compared to DIII and they justified that by indicating that it helps them in developing their care plan. For example, one student stated, "it helps me to recognize the problem and organize my work". Another student indicated "It is very helpful, and it is effective; it helps us to organize our care plan to the help me to implement my action to provide appropriate patient care". And elaborated more about the advantage of concept map by indicating "... save time, make care plan clear and easy to apply. It helps me in data which I collected. It is easy and does not confuse us and reorganize the information, help us to think critically and help me to correlate." However still few found it "difficult to organize plan, and it is wasting of time". This could reflects students learn in different pace.

4.4. Teachers' feedback about students' performance

The teachers were asked to reflect on students' performance in clinical setting after using concept map. Four teachers supervised the students in different clinical settings identified three themes 'critical thinking, evaluation tool and challenges of concept map'. Below are some of the teachers' comments.

4.4.1. Critical thinking

Concept map gave me "a window into my students' mind" to assess their deep understanding and critical thinking abilities in figuring out relationship between the givens". Another teacher indicated that "I consider it a very good indicator of student's critical thinking skills and progress as it allows focus, direct feedback and follow up of performance. Other teacher elaborated more about concept map process by indicating 'when implementing the conceptual map as tool for clinical training I found that students were able to design a visual representation of linkages/connections between a major concept and other knowledge they have learned. By creating these linkages, the students were able to draw reasonable inferences from observation". It's clear from the teachers' comments that students were able to design and implement a better nursing care plan because the exercise of designing a map improved their critical thinking skills and their data collection and analysis process when it came to patient's care. According to the study by Izci and Akkoc the analysis findings demonstrated that the impact of the concept maps was high in the improvement of the academic achievements of the students and could be employed in education [13].

4.4.2. Evaluation tool

The teachers viewed concept map as a process to evaluate the students' performance in developing a holistic patient care for example one teacher stated, "while evaluating their conceptual map I could observe that by this process they were encouraged to view patient care holistically therefore leading them to think about individualized patient care from different perspectives". Another teacher found find concept map as a user friendly and give a comprehensive picture of student performance. "...It was easy to follow up as it summarizes main ideas in patient's care. Easy to evaluate the expected outcome, ability of students to collect and interpret data...". While another teacher elaborated about the process of learning and how it helps teacher to identify gaps in students learning and guide them where to provide support when needed. "...I found Concept maps are ideal for measuring the growth of and assessing student learning. As students create concept maps, they reiterate ideas using their own words. Misdirected links or wrong connections alert nursing tutors to what students do not understand, providing an accurate, objective way to evaluate areas in which students do not yet grasp concepts fully..." and finally one more found it "... an excellent tool to provide information on pre-assessment phase and was very useful in providing synthesize information mainly when dealing with large groups of students in clinical area." In general, the theme about using concept map as an 'evaluation tool' provided a comprehensive assessment of students' performance and guided teacher in the process how students learn. The majority of the teachers had the consensus it assesses and developing their critical thinking.

4.4.3. Challenges of concept of map

Even with the positive feedback there were also a drawback of concept map as per teachers' observation to certain students and this was in correlated with students' negative feedback. For example, one teacher found concept map is 'time consuming' for certain students by indicating 'It took a bit of time for students to start implementing and being confident in using concept map. As this was a new concept, they needed to understand how to transfer the data into specific information to be included in the concept map. Another one commented

'actually understanding the benefits of concept mapping took longer than expected as some students face difficulty in expressing their ideas in a graphic way'. This supports that not all students are visual learner and concept map might not be helpful for them which teachers should look into it when using the concept map as a methodology of teaching.

4.5. Critical thinking, nursing care plan and concept map

To conclude the data analysis, t- tests for independent samples (two-tailed) were conducted to test the three null hypotheses that related to critical thinking, Nursing care plan and concept map between DII and DIII.

4.5.1. Comparing DII and DIII in critical thinking

The first null hypotheses aimed to test that: There is no difference between class level performance and critical thinking. According to Table 3, the DII mean is 4.537 while the DIII is 4.067; this means that there is difference between DII and DIII performance in regard to critical thinking.

Table 3: T-test for Independent Samples of Diploma Class and Critical Thinking

Class type	Number of cases	Mean	SD	SE of Mean		
DII(1)	24	4.5370	0.58855	0.120		
DIII(2)	18	4.0679	1.04519	0.246		
Mean difference= - 0.4691						
Levene's Test for Equality of Variance: F = 4.344 P = 0.044						
t-test for Equality of Means						
Variates	t-value	df	2-Tail Sig	SEof Diff	95% CI for Diff	
Equal	1.847	40	0.072	0.253	(-0.044,0.982)	
Unequal	1.712	25.002	0.099	0.274	(-0.095, 1.033)	

This data shows that class performance has a significant effect on critical thinking, $t(40) = 1.847$, $p < 0.05$. Therefore, the null hypothesis was rejected, and the difference did not occur because of sample fluctuation. Therefore, DII has acquired more critical care than DIII. One of the strategies to develop students' critical thinking is to engage the student in nonthreatening learning process. Where the student will have the chance to explore situation, ask question and find solutions and this was accomplished through concept map.

4.5.2. Comparing Nursing care plan between DII and DIII

The second null hypothesis aimed to test: There is no difference between Nursing care plan (NCP) improvement and class level performance.

In comparing the two classes in regard to care plan performance as presented in Table4, it was found that there is no difference in this regard Although there was little difference in the mean, the DII mean=4.569 while the DIII (4.259); it was not statistically significant supported, $t(40) = 1.261$, $p > .05$.

Table 4: T-test for Independent Samples of Diploma Class and NCP

Class type	Number of cases	Mean	SD	SE of Mean		
DII(1)	24	4.5694	0.67013	0.136		
DIII(2)	18	4.2593	0.92571	0.218		
Mean difference=-0.3102						
Levene's Test for Equality of Variance: F = 0.205 P = 0.653						
t-test for Equality of Means						
Variates	t-value	df	2-Tail Sig	SEof Diff	95% CI for Diff	
Equal	1.261	40	0.215	0.245	(-0.186,0.807)	
Unequal	1.204	29.609	0.238	0.257	(-0.216, 0.836)	

Therefore, the null hypothesis was accepted the difference occurred because of sample fluctuation. Both groups agreed (mean 4.5 to 4, for DII and DIII respectively) that concept map improved their care plan.

4.5.3. Compare between DII and DIII concept map

The third null hypothesis aimed to test. There is no difference between class level's perceptions in regard to usage of concept map.

Table 5: T-test for Independent Samples of Diploma Class and Concept Map

Class type	Number of cases	Mean	SD	SE of Mean		
DII(1)	24	4.2111	0.45372	0.926		
DIII(2)	18	3.9074	0.94589	0.222		
Mean difference=-0.3037						
Levene's Test for Equality of Variance: F = 4.794 P = 0.034						
t-test for Equality of Means						
Variates	t-value	df	2-Tail Sig	SEof Diff	95% CI for Diff	
Equal	1.379	40	0.175	0.220	(-0.141,0.748)	
Unequal	1.258	22.870	0.221	0.241	(-0.195, 0.803)	

The students' perception in regard to concept map as a teaching method was varied between DII and DIII as presented in Table 5, although the difference is minimal; DII mean is 4.2111 while the DIII is 3.90. The difference was statistically significant supported, $t(40) = 1.379$, $p < 0.05$. Therefore, the null hypothesis was rejected, and the difference did not occur because of sample fluctuation. Therefore, DII is more confident with the usage of concept map as compared to DIII.

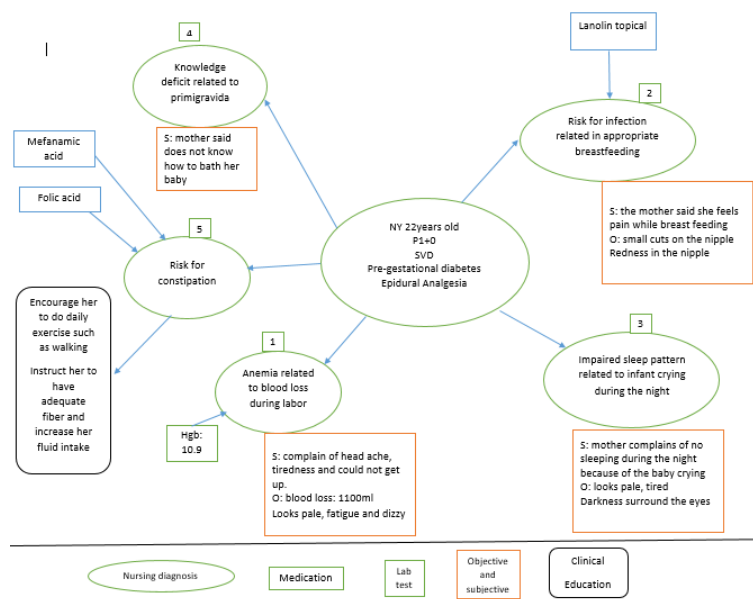


Fig. 1: Sample of Student Concept Map.

5. Discussion

According to Fonseca et al., Concept mapping is one of the teachings and learning strategy that promotes critical thinking skills among students [14]. The result of this study showed that concept mapping is an effective teaching method in clinical setting and a way to improve critical thinking by linking theory to practice as presented by students open ended question and teacher's feedback. This was supported by Mohammadi et al., who concluded in their study that concept map improves students' critical thinking skills when compared to traditional care plan approach [7]. Figure 1, the students were able to relate different data such as laboratory, medication, nursing diagnosis and intervention. Additionally, as an illustration, health education was used as an intervention when the nursing diagnosis risk of constipation was addressed. This helped the students to have a holistic view of patient which helps to help them delivers better patient care which has been supported by previous research study [15]. The importance of the concept map as enhancing teaching and learning and this was acknowledged in literature [11]. This also was supported in this study by null hypothesis and students and teachers' feedback. For instance, one student stated, "it helps me to make a relationship between patient data (sign and symptom, medication and also lab test)". The teacher's feedback was also supportive to same idea when noted that "Concept map gave me a window into my students' mind to assess their deep understanding and critical thinking abilities in figuring out relationship between the givens". The student appreciation for concept map in helping her to be more organized and appreciate the meaningful learning as noted that "it makes me more organized in my clinical work, so when I make concept map I know what I want and [how] it should be, however when I do not do concept map I feel confused and my time is wasted [for not doing the right thing]". In analyzing student statement, one finds a kind appreciation in using this type of teaching and learning method because it gave her a meaningful learning and a better way of understanding the different courses, she took, such as physiology and medication and how they affect each other. Students usually face problem and struggle for studying certain medication. In concept map it became like a puzzle that influence them to look and find out about the drug and how it can improve patient symptom or stimulate unwanted side effect.

Although the study has provided positive outcome of concept map, however, two negative experiences were highlighted by few students and teachers feedback and one of them were mainly related time consuming and this was consistent with other studies[16,17]. The other point was related to difficulty to develop concept map, and this could be to the fact students learn at different pace and are not visual and have been used to use the traditional care plan for long time and finds it difficult to learn new method.

According to Veiga et al., this study contributes to the existing body of knowledge on concept mapping by shedding light on its effectiveness in assessing the organization and representation of knowledge in educational settings, especially for engineering education at different levels and with group and individual testing [18]. Through a comprehensive analysis of various scoring methods and their implications, this research adds nuance to our understanding of how concept maps can be integrated into teaching practices.

One of the limitations of this study that it was conducted in one college and sample size was small therefore the study cannot be generalize, however it added to existing literature about the effectiveness concept map as a teaching and learning method tool as supported by teachers and students.

6. Conclusion

This study supports the use of concept mapping as teaching method in clinical setting to develop nursing care plan and a way to link theory to practice. The finding's revealed students were able to identify linkage between client problem, medications and interventions such action resulted in enhanced critical thinking process, clinical preparedness and confidence in dealing with patient. There were also certain limitations that was addressed reflecting that there are some students who are not visual learners who might requires more time and guidance for adopting this method of teaching. Therefore, further study is required in this area.

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