DEVELOPMENT,VALIDATION AND EVALUATION OF RUSNANI CONCEPT MAPPING(RCM) PROTOCOL ON ACADEMIC PERFORMANCE OF DIPLOMA NURSING STUDENTS

Rusnani Ab Latif[1], Akehsan Dahlan[1], Zamzaliza binti Ab Mulud[1], Mohd Zarawi Mat Nor[2]

[1]Universiti Teknologi MARA, Malaysia.
[2]Universiti Sains Malaysia, Malaysia
E-mail: rusnani.adnan@yahoo.com

Abstract :

Introduction: Concept mapping is an innovative teaching learning strategy. A planned and well-developed of concept mapping protocol is needed so that the nurse educators can be guided in using concept mapping as their teaching strategy, as well as allowing students to explore knowledge in depth in concept mapping. **Methods:** The development of Rusnani Concept Mapping (RCM) based on Mohd Afifi Learning Model (MoAFF) and integrating with ADDIE Model. The validity of the protocol was determined using content and face validity based on the views of seven experts' panel. The study used a pre and post test quasi-experimental design method with a control group. The experimental and control group received education using concept mapping and lecture method respectively. The data was analyzed using descriptive statistic and inferential used paired t test. **Results:** The reliability of the protocol was .820. Students taught using concept mapping had achievement mean score of 11.23 and SD =2.59 in the pre-test, and mean score was 13.19, SD= 1.71 in post test, which a mean gain score of 1.96. Students taught using lecture method had an achievement mean score of 10.71 and SD= 2.24 in the pre-test and mean score of 12.60, SD=1.64 with mean gain score of 1.89 in post test. The mean score of concept mapping structure during clinical practices the experimental group was 65.23 as to compare with control group which was 59.34. There was statistically significant difference between experimental group and control group, p value <0.05. Thus, we can conclude that, the experimental subjects had higher in concept mapping structure score than the control group.**Conclusion:** RCM protocol has high reliability and validity. It is applicable for nursing student and was a good and innovative teaching method in increasing academic performance of nursing students.

Key words: Development, Validation, Evaluation, Rusnani Concept Mapping (RCM), Nursing students

Introduction

The present health care system is growing more complex and challenging. In today's challenging and highly complex health care settings nurses must be able to think critically. Health care problems require nursing students and nurses to have critical thinking skills (Bambini, Washburn, & Perkins, 2009). The Malaysian Vision 2020 aims to produce productive, innovative, critical and creative thinking human resource. To make this vision a reality in nursing, the current teacher centered learning approaches must be transformed to student centered learning. Nurse educators are continually looking for methods that will enhance or improve critical thinking skills. One method that educators could use is concept mapping. New teaching methods must be developed and implemented by nurse educators to assist students to think critically, understand complex relationships, integrate theoretical knowledge into nursing practice, and become lifelong learners (Hicks-Moore, & Pastirik, 2006). Better educated nurses with complex skills and abilities are required to deliver safe and quality patient care in a health care system that is continually changing (National Advisory Council on Nurse Education and Practice, 2015).

Statement of Problem

The traditional didactic approach is not in pace with the nation's mission of preparing students to be creative and critical thinkers, because it based only on examination oriented. This led students to experience less critical thinking, learning subjects merely for examination purposes. This teacher-centered approach does not allow nursing students the time to develop clinical judgment skills, problem-solving abilities, or nursing care skills (Li-Ling, 2006). When this happens, the long term learning will not occur. Therefore, when students are in the clinical field, they cannot perform well and be competent because they cannot relate the knowledge they had learn in didactic theory e.g. care of diabetes mellitus patient and relationship between concept and plan nursing care to their patients. They may not be able to think outside the box due to the traditional method of learning. They would become followers failing to know any better. Therefore the researcher wants to develop and test the impact of Rusnani Concept Mapping (RCM) protocol in academic performance among nursing students. It is hoped that this study will provide guidance in learning using concept mapping learning approach. RCM protocol would be expected to provide guidance to the lecturers for teaching and learning practices where concept mapping will enhance student-centered learning and encourage innovation and creativity among the students.

Objectives of study

1. To develop a teaching and learning guideline using Rusnani Concept Mapping (RCM) protocol in didactic theory and clinical practices.
2. To test the validity and reliability of Rusnani Concept Mapping (RCM) protocol.
3. To compare the academic performance pre and post test of diploma nursing students taught using the Rusnani Concept Mapping (RCM) protocol (experimental group) and those taught the lecture method (control group) during didactic theory.
4. To compare the mean score of concept mapping structure between experimental and control group during clinical practices.
5. To explore the students' perception towards using concept mapping as a learning tool.

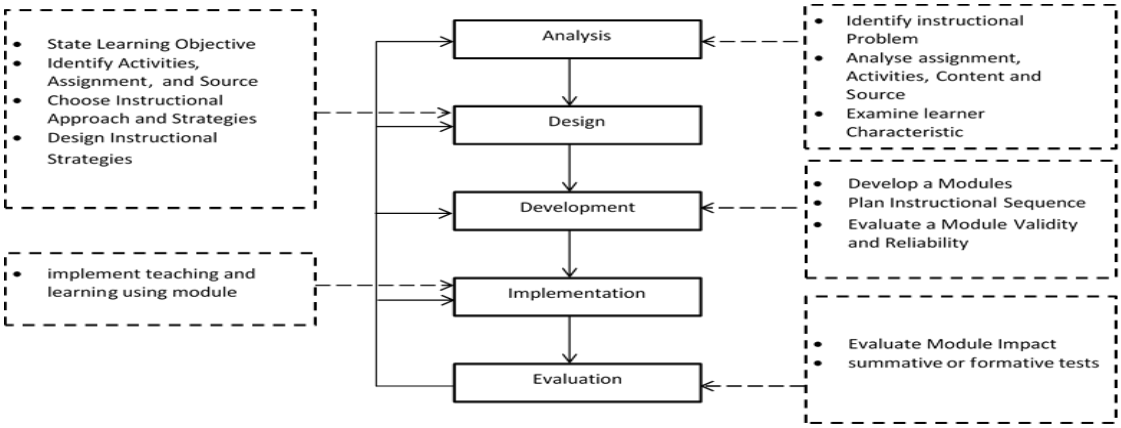
6. To determine the socio demographic data (such as age, educational level, interest in nursing and Grade Point Average (GPA), among nursing students.

Research questions

1. Does the element of Rusnani Concept Mapping (RCM) protocol through three rounds of Delphi technique consensually agreed?
2. Are the content and face validation of Rusnani Concept Mapping (RCM) protocol valid?
3. Does the use of Rusnani Concept Mapping (RCM) protocol have any effect on academic performance on pre and post test among diploma nursing students during didactic theory?
4. Does the use of Rusnani Concept Mapping (RCM) protocol have any effect on academic performance of diploma nursing students during clinical practices?
5. What are the students' perceptions towards using concept mapping as a learning tool?

Stage 1: Development and Validation of Rusnani Concept Mapping (RCM) protocol process.

This protocol is developed according to the phases of the ADDIE Model. Each phase is explained in detail and design modules are based on model Mohd Afifi Learning Model (MoAFF). ADDIE is an acronym for the term Analysis, Design, Development, Implementation and Evaluation (Piskurich, 2006, Ummu Nasibah Nasohah et al., 2015 & Ni Komang Arini et al., 2013). Justification for choosing this model is because this model has features that include a variety of phases of analysis, design, development, implementation and evaluation. Researcher chooses this model as it sees fit with the culture of learning and teaching in Malaysia. In addition, this model focuses on implement teaching and learning using module that is RCM protocol in the classroom which is appropriate to the study. This model has five phases of analysis, design, development, implementation and evaluation. This stage has three phases.



Sign:

Model ADDIE

Model Kemp

Next step

Intergration Step from Kemp model to ADDIE model

Figure 1 Mohd Afifi Learning Model (MoAFF)

i. Analysis Phase

The analysis phase is the foundation of all phases. The researcher must define the problem, identify the cause of problem and determine the solutions. Analyses included also identify type of current learning and examine learner characteristic such as academic background and academic achievement (GPA). According to Shambaugh and Magliaro (2006) reported that the analysis process should included aspects of students, the sex ratio, and the level of student ability. In this study, based on MoAFF model, researcher identifies:

a. Target group

Nursing student semester four (Year 2 Semester II) were selected).

b. Nurse educator

Taking into account the needs of nurse educator, this protocol can be used as alternative learning activities to teach.

c. Title topic selected to teach

Researcher chooses to prepare lesson plan using Rusnani Concept Mapping (RCM) for the topic Medical Surgical in Diabetes Mellitus.

ii. Design Phase

In this phase the researcher need to state learning objectives, learning approach and set the learning activities. Researcher have chosen concept mapping as the main approach of teaching and learning. Kemp, Morrison, and Ross (1998) have suggested that the learning content sequence efficiently is critical to helping consumers or students to achieve the objectives. Shambaugh and Magliaro (2006) stated that four key issues when designing the module. These were;

i. What is to be learned by the students?
ii. How do you identify a student has learned it?
iii. How would you help the student learn?
iv. How media and technology to support student learning?

iii. Development phases

In this phase, researcher develop Rusnani Concept Mapping (RCM) protocol with consists of lesson plan using concept mapping with is consist of assignment (case study based on the scenario) exercise (Concept mapping notes), give MCQ (Multiple Choice Questions) pre and post test to the students regarding topic that have been taught and evaluate the students performance at clinical practice using concept mapping structure.

Stage 2: Validation process

In this phase, validation process involved before implementation phase. Validity and reliability are important in the quantitative study to determine the suitability of an instrument (Kamarul Azmi Jasmi, Ab. Halim Tamuri, & Mohd Izham Mohd Hamzah, 2011).

a. Validation of concept maps structure and MCQ questions

For the validity of assessment using concept maps structure (Appendix IV) and MCQ questions, the Delphi technique was done by given to the experts' panel to evaluate the validity before implementation. The Delphi technique was used to collect data and the validity of the survey was enhanced due to the use of experts in the validation process (Dalkey, 1969 & Wilhelm, 2001). There are ten expert panel involving in

validated the concept mapping structure and questionnaire from University Sains Malaysia (USM), lecturer nursing from USM and Kolej Kejururawatan Kubang Kerian.

b. Validation of content RCM (Didactic theory for subject Diabetes mellitus)

There are two types of validity to be done which is content validity and face validity.

i. Content validity

Content validity refers to the extent to which the content can measure aspects to be measured (Chua, 2006). It is used to determine the content representativeness of the content. Content validity for this lesson plan was established using expert review. According to Faezah Abd. Ghani & Mazlan Aris (2012), the validity of the module is determined based on the views of experts. A range of three to ten content experts is recommended in the literature for content expert review needed in the content validation process (Grant, J.S., & Davis, 1997 & Rubio et al, 2003). A minimum of three experts, but indicated that more than 10 was probably unnecessary (Lynn, 1986). Researcher have to prepare some things before meet the expert such as a letters of appointment, evaluation forms, completed lesson plan and an explanation or instruction.(Rubio et al, 2003).

Therefore, a questionnaire of content validity, the letter of appointment and a brief description sheets were distributed to experts in the field. This evaluation phase is very important to evaluate how they perceive about the RCM protocol of teaching. So in the context of the study in development lesson plan using concept mapping, the researcher had appointed seven evaluators which are three experts in the field of nursing education and four experts in teaching pedagogy from Universiti Sains Malaysia, and the Institute of Teacher Education. The experts were contacted through personal phone calls or emails to ask expert's willingness.

In the review process, experts were asked to read and judge how relevant the items based on content domain according to a 5- point scale (1- Strongly Disagree; 2- Disagreed; 3 -Neither agree or disagree; 4- Agree and 5- Strongly Agree). The items included: the suitability of the target group; the suitability of time in conjunction with the objectives and procedures in an activity; whether the protocol content is able to improve participant's academic and personal achievement; it is able to help change participants' attitude towards excellence. The experts were encouraged to provide comments for each item, whether the items should be modified or dropped, or suggest item content that had perhaps been overlooked.

ii. Face validity

Face validity refers to the assessment of a measuring instrument is seen as a relevant measure, suitable, unambiguous and clear (Oluwatayo, 2012). Several aspects that need to be assessed are to determine the face validity (Oluwatayo, 2012). Among these aspects is spelling, spacing between words, the font size, instructions and the format used. The first process is conducted by asking an expert to assess the first draft of which was developed.

Calculating of Content Validity score

After getting feedback from the four expert panel, researcher analyzed the content validity achievement using the formula that produced by Sidek Mohd Noah and Jamaludin Ahmad (2005). The result is in percentage (%). This formula suggested that if the percentage of content validity achievement is more than 70% show that

$$\frac{\text{Total Score From Expert}(x)}{\text{Maximum Score}(25)} \times 100 = \text{Content Validity Achievement}$$

good content validity and if less than 70% show that the result not good and must advisable to recheck the content according to the objective of study. The formula was followed as below:

Stage 3: Implementation Phases (pilot study)

i. Validity of RCM protocol

An official letter was sent to Director Nursing of College Kejururawatan Kubang Kerian in order to obtain the permission to do pilot study for this study. Pilot study was done at Kolej Kejururawatan Kubang Kerian among semester four nursing students because there are similar characteristic with the research plan. There were thirty respondents involved in this pilot study. The aim of the pilot study is to developing and testing adequacy of research instruments. To establish internal validity a pretest-posttest instrument was implemented. In addition, the pre-test was being implemented so that the researcher could investigate whether the concept mapping strategies "improved" test scores. The implementation stage reflects the continuous modification of the program to make sure maximum efficiency and positive results are obtained. Pilot study was done in this phase before the actual teaching and learning sessions, the researcher giving briefing and guidance to the nurse educator regarding RCM protocol so that the nurse educator capable to use it effectively. This learning session were conducted by lesson plans contained in the RCM protocol for 2 hour.

ii. Reliability of RCM protocol

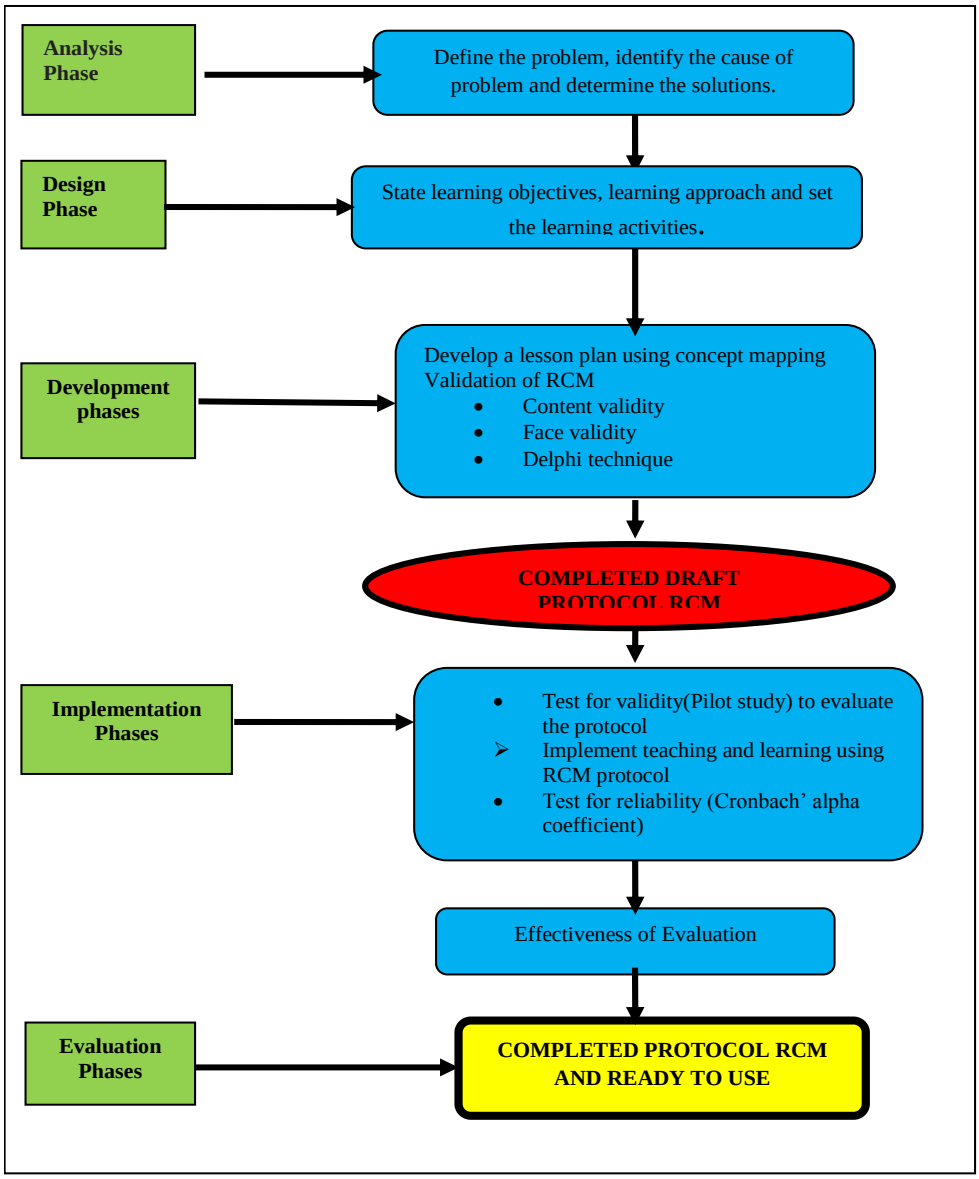
There are various methods of measurement can be used to determine the reliability of a measurement tool of the study (Mohd Salleh Abu & Zaidatun Tasir, 2001). Cronbach (1990) states that one way to assess the reliability index of a module are by using Cronbach Alpha method. In this study, the researcher tested the validity of the measurement instruments RCM protocol internal consistency using Cronbach alpha. Once all the data was gathered, researcher used Statistical Packages for Social Sciences (SPSS) software, Version 23.

Stage 4: Evaluation of the study

The study used a pre and post test quasi-experimental design method with a control group. Based on the randomly sample, the students were selected assigned as control (KSKB Sungai Buluh and Kolej Kejururawatan Melaka) and experimental group (KKKK and KKPP).The experimental and control group received education using concept mapping and lecture method respectively. By using sample size from Krejcie & Morgan (1970) with a confidence level of 95%, the sample size requires would be 218 respondents. For the students in control group was 109 and for the students in experimental group also were 109. There are 4 sections A, B, C and D.

Section A consists of questions regarding socio-demography including age, race, level of education, type of earlier school interest in nursing and Grade Point Average (GPA). Section B consists of 20 Multiple Choice Questions (MCQ) items which were constructed for the purpose of pre- posttest results was analyzed to ascertain academic achievement. Section C: Perceptions of the experiment group toward concept mapping where the experimental group required preparing a concept map. After that the questionnaire regarding the perceptions of the experiment group toward concept mapping comprised 10 items. This questionnaire adapted from study by Chei-Chang-Chiou (2008). The Cronbach Alpha coefficient of the instrument was 0.95 for the study sample. Section D: Assessment using concept maps in clinical

practice. This form were given to the participants while they in clinical practice. It is intended to promote a holistic view of the patient. The score was divided to three categories: adapted from Ainsley (2003) :< 33.3 %(Low); >33.3-66.6 %(Moderate)>66.6 %(High).



Results and analysis

Stage 1: Development and Validation of Rusnani Concept Mapping (RCM) protocol process.

1. **Does the element of Rusnani Concept Mapping (RCM) protocol through three rounds of Delphi technique consensually agreed?**

$$\text{Formula: QD} = \frac{\text{Inter-quartile range}}{2}$$

$$= \frac{(Q3-Q1)}{2}$$

Level Of Consensus And Importance

Quartile Deviation(QD)	Level of Consensus	Median	Level of Importance
Less or equal to 0.5 (QD≤0.5)	High	4 and above (M≥4)	High
More than 0.5 and less than or equal to 1.0 (0.5≤QD≤1.0)	Moderate	3.5 and less (M≤3.5)	Low
More than 1.0 (QD≥1.0)	Low and no consensus	-	-

Formula By Norizan (2003) On Classifications Of Consensus Was Determined At Three Levels

Table 1: Consensus In Concept Mapping Structure Through Three Rounds Delphi Technique.

Item	Round of Delphi								
	Round 1			Round 2			Round 3		
	Median	Mean	QD	Median	Mean	QD	Median	Mean	QD
Statement 1	5.0	4.7	0.5	5.0	4.7	0.5	5.0	4.7	0.5
Statement 2	5.0	4.7	0.5	5.0	4.7	0.5	5.0	4.7	0.5
Statement 3	5.0	5.0	0	5.0	4.7	0.5	5.0	4.7	0.5
Statement 4	5.0	5.0	0	5.0	4.4	1.0	5.0	4.7	0.5
Statement 5	5.0	5.0	0	5.0	4.4	1.0	5.0	4.7	0.5
Statement 6	5.0	5.0	0	5.0	4.7	0.5	5.0	4.7	0.5
Statement 7	5.0	4.7	0.5	5.0	4.1	1.5	5.0	4.7	0.5
Statement 8	5.0	5.0	0	5.0	4.7	0.5	5.0	4.7	0.5
Statement 9	5.0	5.0	0	5.0	4.7	0.5	5.0	4.7	0.5

Table 1 show that in first, second and third Delphi rounds, all the Quartile Deviation(QD) of the statements was less or equal to 0.5 (QD≤0.5), it indicate that the level of consensus was high. In others word all expert panel responses lying into scale of 5 (Very relevant). The median score was used to analyze the level of consensus of experts and result shows that in all three round Delphi the medium result more than 4. It reported that level of importance of the statements were high. In conclusion the concept mapping structure reaching consensus in Delphi Technique and provided a reliable manner to conclude that ten of expert panels overall agreement upon the nine statements assumed.

Table 2: Consensus In Multiple Choice Questions (MCQ) Through Three Round Delphi Technique.

Item	Round of Delphi								
	Round 1			Round 2			Round 3		
	Median	Mean	QD	Median	Mean	QD	Median	Mean	QD
Statement 1	4.0	3.5	2.0	4.0	4.0	1.0	5.0	4.6	0.5
Statement 2	4.0	3.8	1.5	4.0	4.0	1.0	4.5	4.5	0.5

Statement 3	4.0	3.8	1.5	4.0	4.3	0.5	4.5	4.5	0.5
Statement 4	4.0	4.4	0.5	3.0	3.8	1.0	4.0	4.4	0.5
Statement 5	4.0	4.1	1.0	5.0	4.4	1.0	5.0	4.6	0.5
Statement 6	4.0	3.5	2	4.0	3.7	0.5	5.0	4.8	0.5
Statement 7	4.0	3.8	1.5	3.0	3.4	0.5	4.5	4.7	0.5
Statement 8	4.0	3.8	1.5	4.0	3.7	0.5	4.5	4.6	0.5
Statement 9	4.0	4.1	1.0	5.0	4.4	1.0	5.0	4.7	0.5
Statement 10	4.0	4.1	1.0	5.0	4.4	1.0	4.5	4.5	0.5
Statement 11	4.0	4.0	0	4.0	4.4	0.5	5.0	4.8	0.5
Statement 12	5.0	4.7	0.5	4.0	4.1	1.0	4.5	4.5	0.5
Statement 13	3.0	3.3	0.5	5.0	4.7	0.5	4.0	4.4	0.5
Statement 14	4.0	4.0	0	5.0	4.4	1.0	4.5	4.5	0.5
Statement 15	3.0	3.3	0.5	4.0	4.4	0.5	4.0	4.3	0.5
Statement 16	4.0	4.4	0.5	5.0	4.4	1.0	5.0	4.6	0.5
Statement 17	4.0	3.5	2.0	4.0	3.4	1.0	4.0	4.1	1.0
Statement 18	4.0	3.5	2.0	4.0	4.0	0	4.0	4.4	0.5
Statement 19	4.0	3.8	1.5	4.0	3.7	0.5	4.5	4.5	0.5
Statement 20	3.0	3.2	2.0	4.0	4.0	0	4.0	4.2	1.0

Table 2 show that in the first Delphi round, there are statements have low and no consensus which were statements 1, 2,3,6,7,8,17,18,19 and 20. The Quartile Deviation (QD) may be above 1. Respectively, there may be a case where the experts panel responses lying into scale of 2(Not relevant). However after the correction were made, were denoting overall consensus among ten statements. This in turn can conclude that ten of expert panels overall agreement upon the twenty statements assumed. The median score was used to analyze the level of consensus of experts. In first Delphi round, the statements was less than 3.5 were statements 13, 15 and 20. In Delphi round two, after the modified was done based on the comments of experts, these statements got the medium result of 3.5. However the statements of item 4 and 7 got the median less 3.5. In Delphi round three, all the statements got the value of medium 4 and above, which reported that level of importance of the statements were high, except statements no 17 and 20, item that achieved moderate consensus with QD value equal to 1.0, and very important with the value of median was 4.

Stage 2: Validation process

2. Are the content and face validation of Rusnani Concept Mapping (RCM) protocol valid?

Table 3: Content Validation Process Of The RCM Protocol For Lesson Plan Instrument By Four Expert Panels

Content validity question	Scale				
	1 Strongly disagree	2 Disagree	3 Neither agree or disagree	4 Agree	5 Strongly agree
	n (%)	n (%)	n (%)	n (%)	n(%)
The suitability of the target group.					4(100)

The content of this protocol can be implemented properly				2(50)	2(50)
The suitability of time in conjunction with the objectives and procedures in an activity.			1(25)	2(50)	1(25)
The protocol content is able to improve participant's academic and personal achievement.			1(25)	2(50)	1(25)
The protocol content able to help change participants' attitude towards excellence.			1(25)	2(50)	1(25)

Table 4: Division Of Validity Achievement According Percentage Of Four Experts' Panel

RCM protocol	Expert's Score(x/25)x100	Total of Validity Achievement (%)	Validity index
Evaluator 1	18/25x100	72	.72
Evaluator 2	21/25x100	84	.84
Evaluator 3	23/25x100	92	.92
Evaluator 4	24/25x100	96	.96

Results of validation analysis (guideline protocol of lesson plan)

The researcher appointed four experts from education field and also held doctorate degrees. Therefore, their knowledge in lesson plan and teaching methodology experience is knowledgeable and respectable. Almost all the experts suggested that two version of language (Malay and English) of lesson plan and teaching methodology must provided. The researcher took note of this, and prepared it for real experimental study. Table 4 show that the highest percentage was given by elevator 4 (96%) followed elevator 3 (92%) and elevator 2 (84%) and the lowest percentage was given by Elevator 1 (72%). Overall, all elevators agree that RCM guideline protocol is related to the objective of protocol guideline teaching and suitable to the target group. High validity may be accessed through the items in the questionnaire provided 5 Likert scale got higher mean values of 5 and 4.

Table 5: **Content Validation Process Of The RCM Protocol For The Content Of Diabetes Mellitus By Three Expert Panels**

i. Relevancy of questions

No	Relevancy of questions	%
1	Are the definition related to topic of Diabetes Mellitus relevant?	100
2	Are the etiology related to topic of Diabetes Mellitus relevant?	100
3	Are the pathophisiology related to topic of Diabetes Mellitus relevant?	100

4	Are the diagnostic investigation related to topic of Diabetes Mellitus relevant?	100
5	Are the clinical manifestation related to the topic of Diabetes Mellitus relevant?	100
6	Are the risk factors related to the topic of Diabetes Mellitus relevant?	100
7	Are the treatment of non pharmacologic related to topic of Diabetes Mellitus relevant?	100
8	Are the treatment of pharmacologic related to topic of Diabetes Mellitus relevant?	100
9	Are the nursing diagnosis and intervention related to topic of Diabetes Mellitus relevant?	100
10	Are the health education related to topic of Diabetes Mellitus relevant?	100

ii. Accuracy of questions

No	Accuracy of questions	%
1	Are the definition related to Diabetes Mellitus accurate?	99
2	Are the etiology related of Diabetes Mellitus accurate?	100
3	Are the pathophisiology related to Diabetes Mellitus accurate?	100
4	Are the diagnostic investigation related to topic of Diabetes Mellitus accurate?	99
5	Are the manifestation clinical related to Diabetes Mellitus accurate?	100
6	Are the risk factors related to Diabetes Mellitus accurate?	100
7	Are the treatment of non pharmacologic related to Diabetes Mellitus accurate?	100
8	Are the treatment of pharmacologic related to Diabetes Mellitus accurate?	99
9	Are the nursing diagnosis and intervention related to Diabetes Mellitus accurate?	99
10	Are the health education related to Diabetes Mellitus accurate?	100

iii. Sufficiency of questions

No	Sufficiency of questions	%
1	Are the definitions related to the topic of Diabetes Mellitus sufficient?	99
2	Are the etiology related to topic of Diabetes Mellitus sufficient?	100
3	Are the pathophisiology related to topic of Diabetes sufficient?	100
4	Are the diagnostic investigation related to topic of Diabetes Mellitus is sufficient?	99
5	Are the manifestation clinical related to topic of Diabetes Mellitus is sufficient?	99
6	Are the risk factors related to topic of Diabetes Mellitus sufficient?	99
7	Are the treatment of non pharmacologic related to topic of	100

	Diabetes Mellitus sufficient?	
8	Are the treatment of pharmacologic related to topic of Diabetes Mellitus sufficient?	100
9	Are the nursing diagnosis and intervention related to topic of Diabetes Mellitus sufficient?	100
10	Are the health education related to topic of Diabetes Mellitus sufficient?	100

Table 6: Division Of Validity Achievement According Percentage Of Three Experts' Panel

Relevancy of questions	**Expert's Score (x/50)x100**	**Total of Validity Achievement (%)**	**Validity index**
Evaluator 1	50/50x100	100	1.0
Evaluator 2	50/50x100	100	1.0
Evaluator 3	40/50x100	80	0.8

Accuracy of questions	**Expert's Score (x/50)x100**	**Total of Validity Achievement (%)**	**Validity index**
Evaluator 1	50/50x100	100	1.0
Evaluator 2	36/50x100	72	0.72
Evaluator 3	50/50x100	100	1.0
Sufficiency of questions	**Expert's Score (x/50)x100**	**Total of Validity Achievement (%)**	**Validity index**
Evaluator 1	48/50x100	96	0.96
Evaluator 2	35/50x100	70	0.7
Evaluator 3	40/50x100	80	0.8

Results of validation analysis (content of Diabetes Mellitus)

The researcher appointed three experts from education field, where two of them have held doctorate degrees and have experience teaching in diabetic mellitus subject. Therefore, their knowledge in content of Diabetes Mellitus was knowledgeable and respectable. For this content validity, the researcher divided to three parts of questions. In part 1 for relevancy of question, the highest percentage was given by elevator 1 and 2 (100%) followed elevator 3 (80%). Meanwhile for part 2 accuracy of question elevator 1 and 3 give 100% followed elevator 2 (72%). For part 3 sufficiency of question elevator 1(96%), elevator 2(70% and elevator 3(80%). Overall, all elevators agree that RCM guideline protocol were relevant, accurate and sufficient for content of Diabetic Mellitus subject. High validity may be accessed through the items in the questionnaire provided 5 Likert scale got higher mean values of 5 and 4.

Stage 3: Implementation Phases (pilot study)

Results of reliability measure analysis

Cronbach's Alpha was used to assess the reliability index of RCM protocol guideline. All the data was analyzed using Statistical Packages for Social Sciences (SPSS), Version 23.0. From the analysis the RCM protocol obtained .820 for 10 items based on Likert-scale of 1- Strongly Disagree to 5- Strongly Agree. This value is high and accepted.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.820	.823	10

Stage 4: Evaluation of the study

3. Does the use of Rusnani Concept Mapping (RCM) protocol have any effect on academic performance on pre and post test among diploma nursing students during didactic theory?

Socio demographic characteristic of the nursing students

A total of 218 respondents were participated in this study giving a response rate of 100%. The mean age of respondents was 22.14(SD=1.48) which ranged from 19 to 22 years old 151(69.3%) and from 23-26 was 67(30.7%). The peak age was among students of 21 years old category was 96(44.0%). The majority of the respondents involved in this study were Malay was 211 (96.8%) and followed by Indian was 7(3.2%). Most of the religion of respondents were Islam (211, 96.8%) followed by Hindu (5, 2.3%) and Christian (2, 0.9%). Most of the educational level of respondents were SPM level (135, 61.9%), followed by diploma or Degree (58, 26.6%) and STPM (25, 11.5%). Regarding interest in nursing, 203(93.1%) respondents' interest in nursing and 15(6.9%) not interested in nursing. For grade point average (GPA), the mean was 3.26(SD=.22). Most respondents get grade B(3.00) was 101(46.3%), followed by grade B+(3.33) was 79(36.2), grade B- (2.67) was 29(13.3%) and grade A-(3.67) was 9(4.1%).

Table 7: Pre And Post Test Achievement Mean And Standard Deviation Score Of Student In MCQ Due To Teaching Strategy

Teaching strategy	N	Pre test		Post test		Mean gain
		Mean	SD	Mean	SD	
Concept mapping (Experimental group)	109	11.23	2.59	13.19	1.71	1.96
Lecture (Control group)	109	10.71	2.23	12.60	1.64	1.89

Descriptive statistic on academic performance nursing students during didactic theory.

Results obtained from data analysis are presented according to the objective of the study; on the effect of teaching strategies concept mapping and lecture on student achievement mean scores in medical subject of Diabetic Mellitus. Data on Table 6 indicate that at pre-test, the students taught using concept mapping had achievement mean score of 11.23 and a standard deviation of 2.59 while at post test, the achievement mean score was 13.19, standard deviation 1.71 and a mean gain score of 1.96. On the other hand, students taught using lecture method had an achievement

mean score of 10.71 and standard deviation of 2.24 in the pre-test and post test achievement which the mean score of 12.60, a standard deviation of 1.64 with mean gain score of 1.89. This implies that the experimental group appears to have performed better than the control group in the achievement test.

Inferential statistic on academic performance nursing students during didactic theory.

Pair sample t-tests were carried out to present statistical significance for the pre and post tests results scored by student nurse. The alternate hypothesis states that there is a significant difference between the means of the results achieved in pre and post tests between the experimental and control groups. A confidence level of 95% was selected. The comparison of the t value elicited answers to whether concept mapping enhance nursing students performance. There is strong evidence (t=-6.48, p=0.000) that the teaching using concept mapping improves marks. The mean paired difference in marks different from -1.87. In this case, the 95% CI is from -2.44 to -1.29.

The mean score of the control group show that there is strong evidence (t=-8.98, p=0.000) that the teaching using lecture method was statistically significant. The mean paired difference in marks different from -2.47. In this case, the 95% CI is from -3.02 to -1.93. This implies that all post tests carried out showed significant differences between the experimental and control group's scores.

4. Does the use of Rusnani Concept Mapping (RCM) protocol have any effect on academic performance of diploma nursing students during clinical practices?

Descriptive statistic on academic performance nursing students during clinical practices.

Table 8: Distribution Of Concept Mapping Structure Score At Clinical Practice Among Experimental Group And Control Group

Score	Experimental group		Control group	
	n	%	n	%
Low(<33.3%)	-	-	-	-
Moderate (>33.3-66.6%)	57	52.3	72	66.1
High(>66.6%)	52	47.7	37	33.9

Table show that distribution of concept mapping structure score at clinical practice among experimental group and control group. Respondents data were divided into three groups of score average depending on student grade level, with Low (<33.3), Moderate (>33.3-66.6%) and High grade (>66.6%). The experimental group shows a higher grade score with the student got grade high was 52(23.9%) compared with control group that only got 37(17.0%). However the control group shows higher score in Moderate grade (n=72, 33.0%) compared than experimental group (n=57, 26.1%). However, no respondents get low grade.

The mean score of the experimental group was 65.24, SD= 9.28 as to compare with control group which the mean was 59.33, SD= 11.26. By using a Paired t-test, revealed that there was statistically significant difference between experimental group and control group, where t(4.54, 108) and p value <0.05. Thus, we can conclude that,

the experimental subjects had higher in concept mapping structure score than the control group.

5. What are the students' perceptions towards using concept mapping as a learning tool?

Students' perceptions toward concept mapping

The students' responses to the satisfaction questionnaires are shown in Table 9. The responses for each item were converted into 'agree' (answers of 'strongly agree' or 'agree') or 'disagree' (answers of 'strongly disagree' or 'disagree'), and were converted into percentages. Questions 1-4 investigated whether the concept mapping strategy indeed improved learning. The data in Table 9 show that 100% of the students agreed that concept mapping helped them to learn subject in Nursing, integrate and clarify the inter-relationships among curriculum content and also students indicated that concept mapping stimulated them to learn and to think independently. The majority of students (96%) expressed the opinion that concept mapping helped to reduce the barriers and enhance my interest in learning subject in Nursing.

Questions 5–10 related with the degree of the affective acceptance of the concept mapping group. Ninety-eight per cent of the students deemed that concept mapping can be a new teaching and learning approach in Nursing and consider using the concept mapping learning strategy in other curricula. Meanwhile ninety-nine per cent of the students think the concept mapping strategy can be easily used in other curricula, satisfied with using concept mapping to learn subject in Nursing and can adapt to concept mapping. However 100% liked using concept mapping to assist in learn subject in Nursing. The result indicated that most of the students have given positive feedback after learn and applied concept mapping in their learning.

Table 9: Perceptions Of The Experiment Class Toward Concept Mapping (Adapted From Chei-Chang-Chiou (2008))

	Perceptions	**%**
1	Concept mapping helped me learn subject in Nursing	100
2	Concept mapping helped me integrate and clarify the interrelationships among curriculum contents	100
3	Concept mapping learning strategy stimulated me to learn and think independently	100
4	Concept mapping helped me reduce the barriers and enhance my interest in learning subject in Nursing	96
5	Concept mapping can be a new teaching and learning approach in Nursing	98
6	I think the concept mapping strategy can be easily used in other curricula	99
7	I will consider using the concept mapping learning strategy in other curricula	98
8	I was satisfied with using concept mapping to learn subject in Nursing	99
9	I liked using concept mapping to assist me to learn subject in Nursing	100
10	I can soon adapt to concept mapping	99

Discussion

For summary RCM protocol has high content validity and it has been approved high in the Likert scale in the search for determining validity.The findings show that expert panel in fact supported the using of Ausubel learning theory. From the data analysis the reliability of the RCM protocol guideline was .820. It directly shows that the development model of the Sidek Mohd Noah and Jamaludin Ahmad (2005) is suitable to be applied to the development of protocol. RCM is an innovative method of learning which can motivate students and increase student interest in nursing. One of the methods to determine the content validity of a measurement tool is through expert opinion (Mohd. Konting Majid, 1998). It shows that from the expert review, determined that both the content and format of the guideline for RCM protocol were valuable for teaching using concept mapping. From the finding, majority of the panels agree with the content domains that were represented within the guideline of RCM protocol. There are no fixed standard found by local or abroad researchers in relation to the best coefficient reliability value. Reliability module is considered good and acceptable when index value more than .70 (Chua, 2006 & Jackson, 2006). Othman Mohamed (2000), suggests a reliability index value for accepting a new developed module must be between .65 to .85

This finding of this study give further credence to the findings of Ezeudu (1995); Ezeugo and Agwagah (2000); Imoko (2005); Rahmani et al.(2007) and Okonwo (2011) who had reported that students exposed to concept mapping demonstrated greater and in depth understanding of concepts than those exposed to lecture method. Similar finding by Parsa & Nikbakth(2004) stated that concept mapping better than lecture method in producing meaningful learning. Concept mapping is a learning strategy for nursing education, and students found concept mapping to enhance understanding of concepts (Hicks-Moore, & Pastirik,2006). Concept maps have been described as a powerful teaching and learning technique for nursing education that facilitates meaningful learning (Pilcher, 2011). The present research report by McDaniel, Roth & Miller (2005) indicates that concept mapping activities improve students' academic success. The results of this study indicate the participants in the experimental and control group score similarly on the pretest exam. However, a notable difference in the group's post test gains was revealed. However, contrast findings in research study done by Sarhangi et al.(2010) reported that there was no significant difference between experimental and control group in comparing concept mapping and lecture method in find out the effectiveness of learning.

The result of the study reported that students from experimental group have higher gain in concept mapping structure score and performed better than student taught through lecture method. The findings of this study indicates that the use of concept mapping strategies significantly improve students' critical thinking skills as determined by concept map structure scores and academic achievement as measured by post-test scores. In nursing education, concept mapping has been used as a teaching strategy to provide students the opportunity to visualize and integrate theories with the nursing process. Concept mapping of patient problems allowed student and instructor to see interrelationships in patient data, analyze the patient data and plan comprehensive nursing care. The result of the study by Pickens (2007), which included 54 junior baccalaureate nursing students, showed significant correlations among the concept mapping and synthesizer activities and unit exams in three of the eight activities. The literature review, however, revealed no empirical

studies that used concept mapping in diploma nursing programs to foster academic achievement or improve critical thinking abilities.

The result on perceptions of the experiment class toward concept mapping show that overall the experimental group was more positive about the usefulness of concept mapping in enhancing learning effectiveness after they applied it. All the respondents agree that concept mapping is a learning strategy stimulated the students to learn independently. It is similar by the finding study done by Nirmala & Shakuntala.(2012); Ahlberg et al.(2005); Harpaz et al.(2004); Novak et al.(1983); Novak & Gowin (1984). Furthermore, most students pointed out that adopting the concept mapping strategy helped them reduce the barriers and promote their interests in learning subject in nursing. In terms of affective acceptance, the experimental group had a more affirmative attitude for using the concept mapping strategy. The overwhelming majority of the students were of the opinion that concept mapping can be a feasible accounting instructional strategy. Most of the students liked, and felt satisfied with, adopting concept mapping as an assistive learning strategy. The students in the concept mapping group also believed that concept mapping could be easily applied to other subjects. These opinions are consistent with the successful examples of using concept mapping in other disciplines (Ahlberg et al., 2005; Chang et al., 2002; Freeman & Jessup, 2004; Harpaz et al., 2004; Ritchie & Volkl, 2000). In addition, majority of the students indicated that they could adapt to the approach of concept mapping. Furthermore, the concept mapping notes that develop by the student indicates that the understanding of student regarding the subject. It helps the students to summarize and synthesize the subject that already taught. Concept mapping also play pivotal role in enhance student centered learning.

Conclusion

Researcher belief that nursing curricula needs to changes to the student centered learning approach where the students should understand concepts, as opposed to rote memorization of facts. Designing lessons for meaningful learning begins with what educators want students to be able to do and proceeds to the evidence educators will accept that students have learned it. Based on recent studies that support the linkage between conceptual knowledge and meaningful learning, the research outlines the rationale and procedures through which concept mapping can be used to emphasize the conceptual organization of course content. Findings of this study suggest that using concept mapping can improve academic performance in nursing education but significantly more research is needed in order to validly conclude that concept mapping should be embraced by nurse educators. Learning activities using RCM protocol more student-centered and teacher acts as a facilitator. Assessment of this aspect can also be done easily because the outcomes can be seen as a real product that has been produced through concept mapping notes. This is where creativity, innovation, skills and a variety of other elements based learning hands-on can be seen through the concept mapping notes. The major findings in this study there were significant difference in the achievement, mean scores of students taught using RCM and those taught using the lecture method. Furthermore, nursing students who utilized concept mapping strategies can statistically improve their critical thinking abilities as measures by concept map scores. Therefore, concept mapping appears to be significantly superior to the conventional lecture method in enhancing achievement.

References

Ahlberg, M., Aanismaa, P., & Dillon, P. (2005). Education for sustainable living: Integrating theory, practice, design, and development. *Scandinavian Journal of Educational Research, 49*(2), 167–185.

Bambini, D., Washburn, J., & Perkins, R. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. *Nursing Education Perspectives, 30* (2): 79–82.

Chua, Y.P. (2006). Asas Statistik Penyelidikan. Kuala Lumpur: Mc Graw Hill.

Chei- Chang Chiou. (2008). The effect of concept mapping on students' learning achievements and interests. *Innovations in Education and teaching International*, *45*(4), 375-387.

Cronbach, L. J. (1990). Essentials of educational measurement. New Jersey: Prentice HallInc. 1

Chang, K.E., Sung Y.T., & Chiou S.K. (2002).Use of hierarchical hyper concept map in web-based courses. *Journal of Educational Computing Research, 27*, 335–353.

Dalkey, N. C. (1969). An experimental study of group opinion. Futures. 1 (5): 408-426.

Ezeudu, F.O. (1995).Effect of concept maps on students' achievement, interest and retention in selected units of organic chemistry. Unpublished Ph.D Thesis. Nsukka: University of Nigeria.

Ezeugo, N.C. & Agwagah U, N, V. (2000). *Effect of concept mapping on students achievement in algebra: implications for secondary mathematics education in the 21st century ABACUS 25* (91) 1-12.

Faezah Abd. Ghani, & Mazlan Aris. (2012):Pembinaan, Kesahan dan Kebolehpercayaan Modul Kemahiran. *Jurnal Teknologi, 58*, 45–50.

Freeman, L.A., & Jessup, L.M. (2004). The power and benefits of concept mapping: Measuring use, usefulness, ease of use, and satisfaction. *International Journal of Science Education, 26*(2), 151–169.

Grant, J.S., & Davis, L.T.(1997). Selection and use of content experts in instrument development. *Research in Nursing & Health. 20:* 269–274.

Harpaz, I, Balik, C. & Ehrenfeld, M. (Apr-June., 2004). Concept Mapping: An Educational Strategy for AdvancingNursing Education, *Journal of Nursing Forum, 39* (2), Available: www.proquesteducationjournals.com. 13/4/4

Hicks-Moore, S. L., & Pastirik, P. J.(2006). Evaluating critical thinking in clinical concept maps: A pilot study. *International Journal of Nursing Education Scholarship. 3*(1). Retrieved from http://www.bepress.com/ijnes/vol3/iss1/art27

Imoko, B.I. (2005). Effect of concept mapping on students' achievement and interest in trigonometry unpublished Ph.D Thesis, University of Nigeria, Nsukka.

Jackson, S. L.(2006). *Research Methods and Statistics: A Critical Thinking Approach (Second edit).* Belmont: Wadsworth,cengage Learning.

Kamarul Azmi Jasmi, Ab. Halim Tamuri, & Mohd Izham Mohd Hamzah. (2011). Penerapan Matlamat Pendidikan Islam oleh Guru Cemerlang Pendidikan Islam: Satu Kajian Kes di Beberapa Buah Sekolah Menengah Di Malaysia. *Jurnal Teknologi, 55*(Sains Sosial): 37–53.

Kemp, J. E., Morrison, G. R., & Ross, S. M. (1998). Designing Effective Instruction. New Jersey: Prentice-Hall Inc.

Krejcie, R. V & Morgan, D. W. (1970). Small-Sample Techniques. *The NEA Research Bulletin*, Vol. 38 (December, 1960), p. 99.

Li-Ling, H.(2006). An analysis of clinical teacher behavior in a nursing practicum in Taiwan. *Journal of Clinical Nursing. 15*(5): 619-628. doi:10.1111/j.1365-2702.2006.01332. x

Lynn, M.R.(19860. Determination and quantification of content validity. *Nursing Research, 35*, 382– 385.

McDaniel E, Roth B, Miller M. (2005).Concept mapping as a tool for curriculum design. Issues in informing science and information technology [Online]. [2014 April 12]. Available from: http://proceedings.informingscience.org/InSITE2005/I42f49McDa.pdf

Mohd Majid Konting (2004). *Kaedah Penyelidikan Pendidikan*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Mohd Salleh Abu & Zaidatun Tasir. (2001). *Pengenalan Kepada Analisis Data Berkomputer SPSS 10.0*. Kuala Lumpur: Penerbitan Venton.

National Advisory Council on Nurse Education and Practice. (January 2008). Meeting the challenge of the new millennium: Challenges facing the nurse workforce in a changing health care environment, sixth annual report. 01, Retrieved March 27, 2015, from ftp://ftp.hrsa.gov/bhpr/nursing/sixth.pdf

Ni Komang Arini, H. Syahrudin, & I Gde Wawan Sudatha.(2013). Pengaruh Model Pembelajaran ADDIE terhadap

Keterampilan Berpikir Kritis Dalam Pembelajaran IPA Siswa Kelas V di Desa Pedawa. Universitas Pendidikan Ganesha Singaraja.1.Retrieved from http://ejournal.undiksha.ac.id/index.php/JJPGSD/article/view/670

Nirmala, T., Shakuntala, B.S. (December 2012).. Attitude of students on concept mapping- an innovative teaching learning strategy. Nitte University. *Journal of Health Sciences,.2*(4),ISSN 2249-7110.

Norizan, A. R. (2003). Computer Competency of In-Service ESL Teachers in Malaysia Secondary Schools.Unpublished PhD Thesis, Universiti Kebangsaan Malaysia .

Novak, J. D., Gowin, D. B, & Johansen, G. T. (1983). The use of concept mapping and knowledge via mapping with junior high school science students. *Science Education*, *67*(5), 625–645.

Novak, J, D. & Gowin, D. B. (1984). *Learning how to learn.* New York: Cambridge University Press.

Oluwatayo, J. A. (2012)Validity and Reliability Issues in Educational Research. *Journal oEducational and Social Research*. *2*(2): 391–400. http://doi.org/10.5901/jesr.2012.v2n2.391

Okonkwo, I.G.A. (2011). Using concept mapping to teach separation of mixtures in SS 1 in Ojokuku G.O. Amadi,

E.O, Mfon E. Udo and Onwukwe E.O. STAN chemistry panel workshop series 7. 79-82 Zaria, Max Chin Multimedia.

Othman Mohamed. (2000). *Prinsip psikoterapi dan pengurusan dalam kaunseling.* Serdang, Selangor: Penerbit Universiti Putra Malaysia.

Parsa Yekta, Z & Nikbakth Nasrabadi. A. (2004).Concept mapping as an educational strategy to promote meaningful learning. *Journal Medical Education, 5*, 47-50.

Piskurich, M. G.(2006). Rapid Instructional Design; Learninf ID Fast and Right (Second edit). United States of America: John Wiley & Son, Inc.

Pilcher, J. (2011).Teaching and learning with concept maps. *Neonatal Network, 30*(5), 336-338.

Pickens, C. L. (Oct., 2007).Concept mapping: Methods to Improve Critical Thinking. *Journal of Continuing Education in Nursing, 30,* 45 Available: www.proquesteducationjournals.com. 12/4/10.

Rahmani, A, Mohajjel Aghdam, A, Fathi Azar, E, Abdullahzadeh, F. (2007). Comparing the effect of concept mapping and integration method on nursing students learning in nursing process in Tabriz University of Medical Sciences. *Iran Journal Medication Education, 7,* 41-8.

Ritchie, D., & Volkl, C. (2000).Effectiveness two generative learning strategies in the science classroom. *School Science and Mathematics, 100,* (2), 83–89.

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research.* http://doi.org/Article

Sarhangi, F, Masumi, M, Ebadi, A, Seyyed Mazhari, M Rahmani, A. (2010).Comparing the effect of lecture andconcept mapping based learning on cognitive learning. *Iran Journal Critical Care Nursing, 3,* 1-5.

Shambaugh, N., & Magliaro, S. G. (2006). *Instructional Design: A Systematic Approach for Reflective Practice.* UnitedStates of America: Pearson Education Inc.

Sidek Mohd Noah & Jamaluddin Ahmad.(2005). Pembinaan Modul: Bagaimana membina modul latihan dan modul akademik. Serdang, Selangor: Penerbit Universiti Putra Malaysia.

Ummu Nasibah Nasohah, Muhammad Izuan Abd Gani, & Nazipah Mat Shaid@Md Shaid..(2015). *Model ADDIE dalam Proses Reka Bentuk Modul Pengajaran: Bahasa Arab Tujuan Khas di Universiti Sains Islam Malaysia Sebagai Contoh.* In Proceedings of the International Seminar on Language Teaching ISeLT 2015 (pp. 4–5). Bangi.

Wilhelm, W. (2001). Alchemy of the oracle: The Delphi technique. *The Delta Pi Epsilon Journal. 43*(1): 6-26.