International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-1, November 2019

The Use of Concept Maps to Evaluate Learning Strategies for Nursing Students

Brahim Darraj, Bouchra Gourja, Abderrazak Faiq Soufiane Zerraf, El Mostafa Tace and Said Belaaouad

Abstract*: *Context: This work is a part of the evaluation of learning for nursing students at the My Youssef hospital center in Casablanca The purpose of this study was to evaluate student learning strategies using the concept map technique for learning the concept of Therapeutic Education of the Diabetic Patient (TEDP) among nursing students..

Method: As part of the training of nursing students, we suggested that they make 2 concept maps based on the concept of TEDP, a map before the clinic internship and a second map after 2 months of internship. The concept maps were analyzed by calculating the complexity index of the first and the second map by counting the number of concepts on the map and the number of links. The Wilcoxon test was used to describe the differences between the first and second cards produced by the students.

Results: 40 concept maps made by 40 participants were analyzed with the corresponding comments. The evolution of the concept maps of the 40 participants shows a real appropriation of this concept; the knowledge is enriched and organized progressively. The students produce several links between the concepts, which can make think of deep learning.

Conclusion: the concept map is an interesting technique for learning a new concept during a self-training activity because it encourages, simultaneously with its development, a metacognitive reflection.

Keywords*: *concept maps, learning strategies, nursing students, assessment.

I. INTRODUCTION

In the field of health, concept maps (CM) are used to develop and evaluate the skills of professionals in training [1]. CM is mainly used in the preclinical curriculum, especially in medicine [2]. Few studies have focused on the use of cards in paramedical assessment, whereas they can, as West points out, explore the organization and use of knowledge, identify gaps, misinformation, or difficulties in linking the concepts [4]. Psychometric deficiencies considered sufficient, the maps meet the criteria of the formative or diagnostic evaluation more than those of the summative evaluation [5]. In Morocco, Professor Harouchi (2010)[3], points out that: "in the field of health, the best example is that of the health sciences student able to recite from memory the signs of an illness and incapable of solving the problem in front of a sick person. It seems that this phenomenon spares no level of education nor any of the systems centered on the pedagogy of content ".

In this respect, we have tried to use the C.M to evaluate the modifications of the students' representations on the TEDP concept after a period of practical training.
The research question is as follows: "What are the learning strategies developed by nursing students for learning the TEDP concept after a period of practical training?".

II. THEORETICAL FRAMEWORK

A. Learning strategies

According to Phillippe (1997) [6], the learning strategies developed by students are based on understanding and establishing links between content, but also, according to their perception of the demands of teaching.

The work of Marton & Säljo (1976) [7], Entwistle (1988) [8], Romano (1991) [9] distinguishes between surface learning, deep learning and strategic learning.

B. Surface learning

Based on Romano, in the surface approach, the student essentially tries to satisfy the requirements of the task, which is also considered as imposed from the outside: he\she tries to memorize the various elements without fully understanding them, for the sole purpose of being able to reproduce them during the evaluation. In other words, it is limited to what is necessary.

C. The deep learning

The work of Rosario (2007) [10], the strategy of depth leads the student to consider the study of a lesson as an opportunity to understand the world, to respond to his\her interests, to develop his skills. For Larue (2009) [11], deep learning refers to behaviors in which students actively process information and use elaboration and organization strategies rather than memorization strategies.

Revised Manuscript Received on November 30, 2019.
***** Correspondence Author
Brahim Darraj*,Ben M'Sik Faculty of Sciences, Laboratory of Physical Chemistry of Materials LPCM, Hassan II University of Casablanca, Morocco. Email: br.darraj@gmail.com
Bouchra Gourja, Regional Center for Education and Training, Casablanca. Morocco. Email: bouchragourja@gmail.com
Abderrazak Faiq, Ben M'Sik Faculty of Sciences, Laboratory of Physical Chemistry of Materials LPCM, Hassan II University of Casablanca, Morocco. Email: abderrazak.faiq@gmail.com
Soufiane Zerraf, Ben M'Sik Faculty of Sciences, Laboratory of Physical Chemistry of Materials LPCM, Hassan II University of Casablanca, Morocco. Email: soufiane.zerraf@gmail.com
El Mostafa Tace, Ben M'Sik Faculty of Sciences, Laboratory of Physical Chemistry of Materials LPCM, Hassan II University of Casablanca, Morocco. Email: mostafatace@gmail.com
Said Belaaouad, Ben M'Sik Faculty of Sciences, Laboratory of Physical Chemistry of Materials LPCM, Hassan II University of Casablanca, Morocco. Email: belaaouad.s@gmail.com

His\her learning strategies are centered on understanding: linking new ideas to what he\she already knows, to everyday life, searching for the common thread, annotating critically, establishing relationships between the different lessons.

D. The strategic learning

Biggs (1987) [12] identifies a third (strategic) approach based on "extrinsic" motivations for successful studies and exams. This approach directs the student towards the search for good academic performance and recognition by others (teachers and peers) as a good student. The methods used are strategic: manage your time effectively, look out for ways of evaluate of each teacher, adapt to the instructions (understand if you have to understand, memorize if you have to memorize).

E. Concept maps, a tool for evaluation

The idea of a concept map has been developed for more than 30 years by Novak and his colleagues at Cornell University. Novak's work is in line with Ausubel's conception of learning [13], which clearly distinguishes "machine learning" from "meaningful learning", which takes into account the learner's previous knowledge.

According to Novak [14]. They are graphs on which the concepts of a given domain of knowledge, and the links existing between these concepts are represented.

It is therefore a schema to better understand the relationship between the various concepts mentioned by the author.

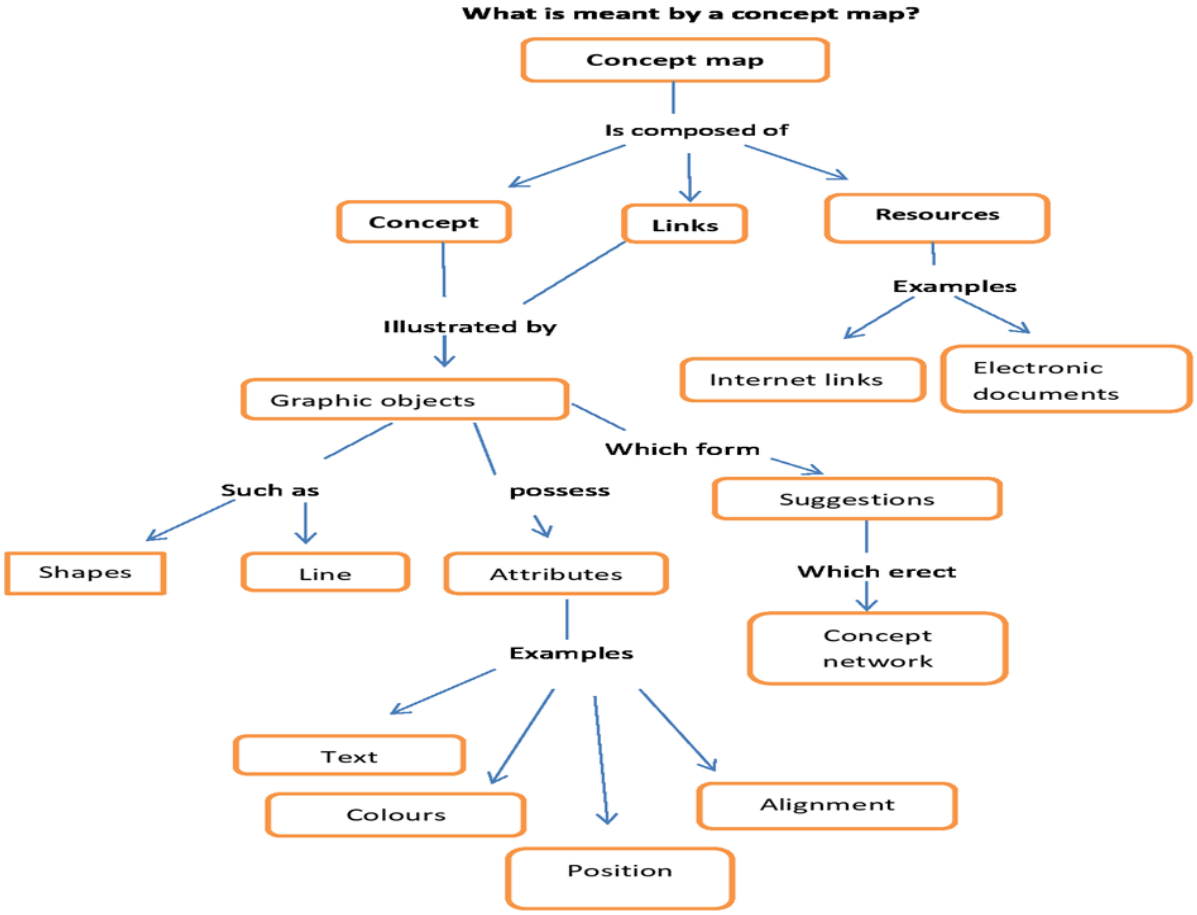

Figure 1 - Simple Concept Map

Gowin offers different uses of concept maps:

- The map can be built by the teacher and then used to organize the lesson.
- It can be constructed by the teacher and presented to the learners as a non-linear representation of the domain.
- It can be constructed by a group of learners. The divergence of points of view between participants can generate sociocognitive conflicts.
- It can be constructed by a learner alone. This map can then be analyzed by the teacher who will deduce the conceptions and misunderstandings of the learner.

Concept maps are used to promote learning but also as an evaluation tool [15, 16]. They take all their meaning in the context of an active pedagogy, aiming at creating favorable conditions for the mobilization of internal and external resources by the student.

III. MATERIALS AND METHODS

A. Study design

This experimental research took place in the context of the practicum of hospital nursing, at My Youssef hospital in Casablanca, between February 1st and April 1st, 2019.

The aim of this study was to evaluate the learning strategies of nursing students using the concept map technique for learning the concept of TEDP.

B. The target population

The target population consisted of 40 nursing students enrolling in semester 3 multipurpose nurse option and having followed a module on basic nursing (33 female and 7 male, aged between 19 and 24 years).

After receiving complete information on the purpose and content of the experiment, all students gave their consent.

C. Data collection

The data collection was spread over a two-month period using the concept maps.

Beforehand, we showed an example of a CM realized from a concept related to the field of health ("nursing diagnosis"), so that they have the possibility to get an idea of how to build it. Then we proposed to them to make 2 concept maps from the concept of TEDP.A map before the clinic internship and a second map after 2 months of internship.

D. Data analysis

To evaluate these maps, we used the method proposed by Barras and Dayer (2017) *[17]*, to calculate the complexity index(CI) of the maps by counting the number of concepts presented on the map compared to the number of links: CI = number of concepts divided by number of links. The concept maps were analyzed by calculating this index for the pre-training map and the post-training map by counting the number of concepts presented, on the map, as well as the number of links. This index is interpreted as follows:

- If CI is equal to 1, we can say that there is a correspondence between the number of concepts and links, so the student connects each concept to another one in a binary way. This can be thought of as a strategic-type of learning with an understanding of simple correspondence between concepts;
- If CI is greater than 1, we can say that the map has more links than concepts, so the student produces several links between the concepts. This can be considered as in-depth learning since it promotes the links between the different concepts from the lesson;
- If CI is less than 1, we can say that the map has fewer links than concepts, so the student remembers concepts but he\she struggles to articulate them. This may be considered as surface learning without understanding.

Then we did an inferential analysis of the components of the first and second maps produced by the students using the Wilcoxon test. This test makes it possible to test in the same population whether two rankings are the same or not.

The test is based on the following decision rule:

p = probability, if the null hypothesis was true (that is to say in the absence of difference between the pre-training maps and the post-training maps)

a = threshold of significance: accepted risk of error, fixed in advance; here a = 5%

-If p ≥ a, we cannot reject the null hypothesis. It is therefore concluded that the difference is not significant at 5%.

- If p <a = we reject the null hypothesis. It is concluded that the difference is significant at 5%.

IV. ANALYSIS OF THE RESULTS

Table- I: the complexity index of pre-training and post-training maps

Index	Pre-training maps	Post-training maps
Concepts	6.62	11.47
Levels	5.5	7.5
Links	10.8	14.52
Complexity index(CI)	1.10	1.26

In this table we notice a transformation of students' representations about the TEDP concept after a period of practical training. Thus, the second maps are more developed than the first ones, with more links, more concepts and more levels. The map complexity index indicates that there are more links than concepts, so students produce many links between concepts. This can be considered as a deep learning since it promotes the links between the different concepts of the lesson.

Table- II : Wilcoxon ranking test

	CI post-training – CI pre-training
Z	-1,529
Asymp. Sig. (2-tailed)	,126

Regarding the Wilcoxon test, the value of p = 0.126 > 0.05. So, the difference between the medians of the pre-training and post-training maps is not statistically significant.

This can be explained, by the fact, that students have developed their knowledge (concepts and levels) between the beginning and the end of the training. However, the complexity index of post-training maps does not indicate much difference compared to pre-training maps, because students are not able to establish a rich network of links and therefore increase the complexity of their post-training map.

V. DISCUSSION AND PERSPECTIVES

At the end of this work, we have shown that concept maps are a tool for evaluating the transformation of student learning on a given concept, from surface learning to deep learning by establishing a rich network links, concepts and levels.

Our results are supported by those of Claire Marchand, Jean-François D'Ivernois (2004) [18], who showed, in a study on concept maps in health training, that in the particular field of Therapeutic education, the importance of the concept map technique as a support for teaching and formative evaluation, they are useful for helping people to learn meaningfully and deeply. They can be used by trainers and teachers to plan and structure their teaching as well as to link different disciplines. Finally, used as a means of evaluation, they seem to be one of the few tools to be able to account for learners' learning processes as well as their knowledge organization.

Barras and Dayer (2017) have shown in a study on the evaluation of learning by the concept map that it is a means of developing strategies in depth, because it builds on the current theories of cognitive development by placing the student in an approach favoring the remembrance and mobilization of the concepts learned. CM is an external representation of knowledge in the form of a network of "nodes" representing concepts, and links representing the relationships between these concepts.

In education, it is considered a "cognitive tool" that promotes meaningful learning, that is, an in-depth understanding of complex conceptual knowledge, but also a "metacognitive tool," aimed at developing the ability to self-regulation of learning.(Chastragnat, Marchand (2012)) [19].

The creation of concept maps by learners is an activity that promotes the active and reflexive construction of their knowledge. It allows a deeper treatment of information, resulting from efforts to identify key concepts and their relationships, the creation of a mental schema and the reorganization of information.

VI. CONCLUSION

This study focuses on the use of concept maps to evaluate learning strategies for nursing students.

The objective was to show that the concept maps reveal what students know about a subject by organizing an integrative vision of the concepts and relationships that unite them, thus describing the type of strategies adopted by students.

An analysis of the complexity index of the pre-training and post-training maps shows that nursing students produce many links between concepts. This can be considered as an in-depth learning since it promotes links between the different concepts of the lesson.In summary, the concept map, according to the interests it presents, can serve as a technique for evaluating learning. It can be used at the beginning of learning or at the end. The small number of students (40 in total) and the contextual character (only one hospital) do not make it possible to generalize the results. Moreover, the representativeness of the sample cannot be asserted, the conceptual maps made by the students having been anonymous.

REFERENCES

1. D. C. West and al., (2002, October 01). *Concept mapping assessment in medical education: a comparison of two scoring systems*.Medical Education. Vol. 36, pp. 820-826. Available: https://doi.org/10.1046/j.1365-2923.2002.01292.x
2. A. Demeester, D. Vanpee, C. Marchand, C. Eymard. (2010, December 13). *Formation au raisonnement clinique: perspectives d'utilisation des cartes conceptuelles*. Pédagogie Médicale. Vol. 11(2), pp. 81-95. Available: https://doi.org/10.1051/pmed/2010013
3. A. Harouchi, *Pour un enseignement efficace, l'approche par compétences. Guide à l'usage des enseignants et des formateurs*. Rabat, Editions le Fennec, 2010, pp. 58-62.
4. B. Tribollet, F. Langlois, L. Jacquet, *Protocoles d'emploi des cartes conceptuelles au lycée et en formation des maîtres*. Montpellier : TREMA – IUFM, 2000, pp. 18-61.
5. M. Mac Neil.(2007, May).*Concept mapping as a means of course evaluation*. J Nurs Educ. Vol. 46, pp. 232-234.
6. M. Philipp , M. Romainville, B. Willocq, (1997). *Comment les étudiants anticipent-ils leur apprentissage à l'université ?* Revue des sciences de l'éducation. Vol. 23(2), pp. 309-326. Available: https://doi.org/10.7202/031918ar
7. F. Marton, R. Säljo. (1976). Outcome as a function of the learner's conception of the task. British Journal Education of Psychology. Vol. 46(2), pp. 115-127.
8. N. Entwistle, Motivational factors in students' approaches to learning. dans R.R. Schmeck (Ed.), Learning Styles and Learning Strategies, New York, Plenum Press, 1988, pp. 21-51.
9. G. Romano, (1991). Étudier… en surface ou en profondeur ? Pédagogie collégiale, Vol. 5(2), pp. 6-11. Available: http://aqpc.qc.ca/sites/default/files/revue/romano_05_2.pdf
10. P. Rosário, (2007). *Voix d'élèves sur l'apprentissage à l'entrée et à la sortie de l'université : un regard phénoménographique*. Revue des sciences de l'éducation. Vol. 33(1), pp. 237–251.Available: https://doi.org/10.7202/016196ar
11. C. Larue, M. Hrimech. (2019, September 14). *Analyse des stratégies d'apprentissage dans une méthode d'apprentissage par problèmes : le cas d'étudiantes en soins infirmiers*. Revue internationale de pédagogie de l'enseignement supérieur. Vol.25-2, pp.3-4 Available: http://ripes.revues.org/221
12. J. B. Biggs, (1987). *Student approches to learning and studing*, Melbourne: australian council for educational research. Available: https://files.eric.ed.gov/fulltext/ED308201.pdf
13. DP. Ausubel. Educational psychology: A cognitive view. New York: Holt, Reinhart & Winston, 1968
14. Novak J. D. (1990, January). Concept maps and Vee diagrams: Two metacognitive tools for science and mathematics education. Instructional Science. Vol. 19, pp. 29-52.
15. C . Marchand, JF.d'Ivernois.(2004, November). Les cartes conceptuelles dans les formations en santé. Pédagogie Médicale. Vol. 5, pp. 230-400. Available: https://doi.org/10.1051/pmed:2004031
16. C. Marchand, R. Gagnayre (2004, February). *Utilisation de la carte conceptuelle auprès de formateurs en santé pour l'apprentissage de concepts* pédagogiques. Pédagogie Médicale. Vol. 5(1), pp. 13-23. Available: https://doi.org/10.1051/pmed:2004002
17. H. Barras, E. Dayer. "*Comment faire appel à une carte conceptuelle pour évaluer les apprentissages ?*", [*in*] J. Demougeot-Lebel (dir.), *comment évaluer les apprentissages dans l'enseignement supérieur professionnalisant ?*, Louvain-la-Neuve, De Boeck Supérieur, 2017, pp. 184-196.
18. C. Marchand, J-F. D'Ivernois (2004, November). *Les cartes conceptuelles dans les formations en santé*. Pédagogie médicale, EDP sciences. Vol.5(4), pp.230-240. Available: https://doi.org/10.1051/pmed:2004031
19. P. Chastragnat, C. Marchand (2012, September 3). *Les cartes conceptuelles : un outil au service de l'évaluation des compétences*. Pédagogie Médicale. Vol. 13 (4): pp. 257–272. Available: https://doi.org/10.1051/pmed/2012025

AUTHORS PROFILE

Brahim Darraj, PhD student researcher in engineering and didactics of sciences and technologies and member of ADMEE-Europe (Association for the Development of Methodologies of Evaluation in Education). I am working on the assessment of health care. I participated in national and international conferences on the evaluation of learning.

Bouchra Gourja, Professor at the Regional Center for Education and Training of the Casablanca Region (CRMEF) · Physics Chemistry teacher researcher in education and didactics.

Aberrazak Faiq, PhD student researcher in engineering and didactics of sciences and technologies and member of ADMEE-Europe (Association for the Development of Methodologies of Evaluation in Education).

Soufiane Zerraf, PhD student researcher at the physico-chemistry of materials laboratory, I participated in scientific congresses in Moroccan and foreign universities. I studied the physicochemical properties of condensed phosphates and also the didactics of science and technology. I worked as a contract teacher at the Ben M'sik Faculty of Science.

El Mostafa Tace, Professor of Higher Education: at Faculty of Sciences Ben M'sik Casablanca, Hassan II University of Casablanca, Morocco.

Said Belaaouad, Professor of Higher Education: at Faculty of Sciences Ben M'sik Casablanca, Hassan II University of Casablanca, Morocco. Director of the Laboratory of Physical Chemistry of Materials.