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Systematic Review

Using Concept Maps for Nursing Education in Iran: A Systematic Review

Morteza Ghojazadeh[1], Mir Hossein Aghaei[2], Mohammad Naghavi-Behzad[3], Reza Piri[4], Hakimeh Hazrati[5], Saber Azami-Aghdash[6]*

[1] *Liver and Gastrointestinal Diseases Research Center, Tabriz University of Medical Sciences, Tabriz, Iran*
[2] *Tabriz Health Services Management Research Center, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran*
[3] *Medical Philosophy and History Research Center, Tabriz University of Medical Sciences, Tabriz, Iran*
[4] *Student's Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran*
[5] *Medical Education Research Center, Tabriz University of Medical Sciences, Tabriz, Iran*
[6] *Hospital Management Research Center, Iran University of Medical Sciences, Tehran, Iran*

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Abstract

Introduction: Considering the importance, complexity, and problems in nursing education, using efficient and new methods in nursing education seems to be necessary. One of the most important of these methods which has received attention in recent years is the use of concept maps. Therefore, the aim of this study was systematic review of studies conducted in this field.

Methods: Required information for this systematic review study was collected using keywords of concept map, learning, retention, nursing education, critical thinking skill, and Iran and their English synonyms in data bases of Iranmedex, Magiran, Science Direct, PubMed, Google scholar, Medlib, and SID. No time limitation was considered for searching articles. Articles published in Farsi and English have been searched.

Results: Results show that concept maps have a significant effect on improving critical thinking of learners. Compared to other educational methods such as lectures; using concept maps show higher efficiency in deep and meaningful learning. Besides, concept maps have a significant effect on learning (relationship of theory and practice, improvement of clinical experiences, organizing concepts, and self-regulation).

Conclusion: According to the importance of nursing education and its available problems on one hand, and the use and applicability of concept maps on the other hand (as well as ignorance about this educational method), it seems necessary to plan for the development of using concept maps in educational nursing.

Introduction

During recent years, in a number of countries, nursing education underwent many changes after joining with universities, and it has faced many problems.[1] Therefore, in order to solve these problems, using different methods has been the focus of attention in most of these countries. With the improvement of nursing science and its complexity, nursing professors should use strategies for education that help students to achieve effective methods of learning. To reach this goal, nursing professors should use modern educational and learning strategies in such a way that students can move from superficial learning toward conceptual and critical learning, and use problem-solving patterns.[2]

One of the most effective of these learning strategies whose effect has frequently been investigated and confirmed is the "concept map". However, its usage has been neglected in nursing[3] and nursing references have introduced it as a modern method for student learning[4]. The theoretical framework of the concept map is based on David Ausubel's reception learning theory. Ausubel believes that learners cannot achieve real knowledge by memorizing and scattered learning, but they should improve their meaningful learning by organizing, relating, and regular addition of contents to the previous cognitive structure.[5] Ausubel considers meaningful learning to be high level learning as well as the end goal of learning. Meaningful learning appears when learner actively connects new learning to the content already available in his mind. In this type of learning, due to the logical relationship between previous and new learning, a learner has more a suitable retention from learned contents and would be prepared for further learning.[6,7]

***Corresponding authors:** Saber Azami-Aghdash, Email: saberazami@yahoo.com

A concept map is a two-dimensional schematic tool for presenting a group of concepts in a framework of propositions. In fact, a concept map is a graphical presentation of the relationship of a concept with another concept and their relationship with relevant concepts of a specific topic. Conceptual mapping is one of the active teaching methods in nursing education which could help nursing professors in training students in critical thinking and problem solving ability.[8,9]

Since applying this method could be time consuming for nursing teachers, and its usage could be considered challenging for new teachers, studying its effects on the nursing field seems necessary. There are many articles in nursing contexts that suggest using this method for theoretical training of students, illustrating the relationship between theory and clinic, improving and evaluating critical thought, registering care plan, course evaluations, and providing comprehensive patient-oriented cares by students.[10,11]

Therefore, the aim of the current study was to conduct a systematic review of previous studies on effect and efficiency of concept maps in nursing education. It is hoped that its results could be useful in improving usage of this educational method in nursing education in Iran.

Materials and Methods

This study is a kind of systematic review study which was designed and conducted in 2013. Required information has been collected using the keywords of concept map, learning, retention, nursing education, critical thinking skills, and Iran and their English synonyms in data bases of PubMed, Google scholar, Medlib, SID, Iranmedex, Magiran, Science Direct, and Google search engine, manual searching of journals, unpublished references (Gray Literature) and references of selected articles (reference of references). No time limitation was considered for searching articles. Articles published in Farsi and English have been searched.

Inclusion criteria were: studies conducted on nursing education and conducting studies in Iran. Exclusion criteria were: articles presented in congresses and seminars, case reports, letters to editors, and educational articles. To evaluate the quality of selected articles, after extracting articles from desired bases using mentioned keywords, they were evaluated by two evaluators using available checklists and cases of conflict between two evaluators were referred to a third person. First, titles of all articles were investigated and articles that were not compatible with the aims of the study were excluded. In other stages, abstracts and full text of articles were respectively studied to identify and exclude articles with a weak relationship to study objectives. The primary result of searching included 765 articles. After omitting irrelevant articles, common among bases, a weak relationship with study objectives, etc., 10 cases were included in the study (Figure 1). Selected articles were completely studied and investigated and required information was extracted and summariezed using the designed extraction table. Resource managing software Endnote X5 was used to organize study and identify repeated cases.

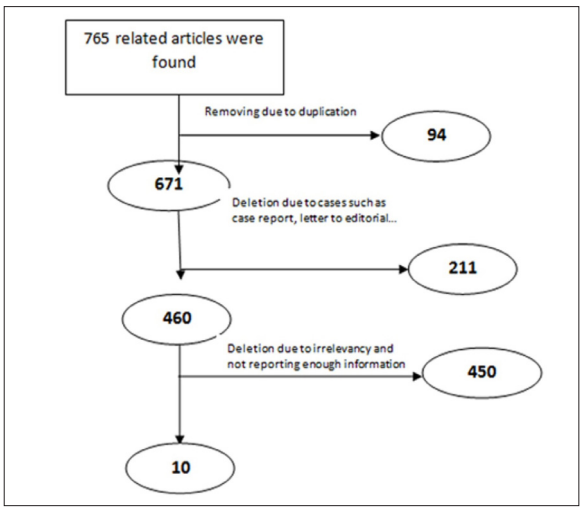

Figure 1. Literature review and retrieval flow diagram

Results

Characteristics of studied articles have been shown in Table 1. In 10 investigated articles, a total of 512 people were studied. Among the total 10 investigated studies, the effects of concept mapping had been investigated in the three general fields as follows: Effects of concept mapping on critical thinking: Two studies were conducted in this field. In both, there had been two months of intervention, and necessary training was provided before execution. In both studies, the effects of concept mapping on critical thinking was significant (P=0.001).

Comparing concept mapping with other educational methods:

Four studies have also been conducted in this field. In all, the concept mapping method and another educational method (lecture and integrated method) were respectively executed in intervention and control groups for two months.

In three of the four studies mentioned above, the effects of two educational methods on low-level learning and meaningful learning had been investigated, and in all three studies there was no significant difference in low-level learning between intervention and control groups (P> 0.05). But the level of meaningful learning showed a significant difference between two groups (P<0.05). Besides, in one study mean changes of learning score was significant in two groups, control and intervention (P=0.01). However, the mean of the learning score difference in two stages (pre-test and post-test) was higher in the intervention group than that of the control group, and was also statistically significant (P<0.05).

Effect of concept mapping on learning amount

There were five studies conducted in this field, and evaluation was done considering low-level scores and high-level scores of learning. In two studies with intervention for 20 days, high-level learning scores (deep, cognitive strategy, and self-efficacy learning) were significantly

Table 1. Characteristics of studied articles

	Name of author/year of study and place	Number of samples	Investigated index	Case group (mean±standard deviation		Control group (mean±standard deviation)		*p*	Investigation time	Other cases
				after	before	after	before			
1	Masoumi et al/ 2010-2011/ Medical sciences of Army [12]	66		15.30(5.4)	32.21(2.81)	11.87(2.48)		*P<0.005*	Before intervention, immediately after intervention, and 4 weeks after intervention	Effect of lecture and concept map on learning
2	Ayin and Foruzandeh/2012/medical sciences of ShahreKord[13]	30	Acquired score of concept map	5.1(1.11) First day	19(0.69) Ninth day			*P<0.001*	First day, and the fifth and ninth days of internship	Efficiency of using concept map in learning
3	Rezaei et al/2010/ Arak nursery	53	Cognitive strategies	2.59(1.01)	3.72(1.13)	2.68(0.99)	2.71(0.87)	*P=0.02* *P=0.46*	First and last days of internship	Effect of concept map on learning
			Self-efficacy	3.01(0.77)	4.21(0.71)	3.22(0.61)	3.32(0.72)	*P=0.02* *P=0.31*		
			Self-regulation	2.66(0.42)	2.72(0.49)	2.81(0.66)	2.77(0.87)	*P=38* *P=41*		
4	Nejat et al 2010 Arak nursery [14]	53	Deep learning	25.1(5.77)	28.33(5.99)	24.48(6.54)	24.99(6.94)	*P=0.03* *P=0.56*	First and last days of internship	Effect of concept map on learning strategies
			Surface learning	28.41(5.49)	27.72(5.37)	27.09(5.36)	27.17(5.91)	*P=0.34* *P=0.64*		
5	Sarhangi et al/ 2010-2011/ Nursing faculties of Tehran [15]	66	Total score of critical thinking skill	7.30(2.1)	16.51(3)	7.45(2.07)	12.90(2.1)	*P<0.001*	Before start of classes and after 8 sessions of intervention	Effect of concept map on critical thinking skill
6	Sarhangi et al/ 2010-2011/ Nursing faculties of Tehran [16]	66	Overall score of knowledge and meaningful learning	15.3	32.21	11.88	25.7	*P<0.01*	Before start of classes and after 8 sessions of intervention and four weeks later	Effect of concept map and lecture on learning levels
			Overall retention score	26.73		21.21		*P<0.01*		
7	Fanbari et al/2010 Rasht nursing and midwifery [17]	66	Learning score	3.61(2.55)	12.41(4.7)	3.87(2.52)	9.64(5.06)	*P<0.05*	Before start of training and end of semester and four weeks later	Effect of concept map on learning and retention
			Retention score	11.72(4.85)		9.33(5.24)		*P<0.05*		
8	Rahmani et al/2005-2006/ Nursing and Midwifery of Tabriz[18]	45	Knowledge level	15.21(2.12)	24.50(3.25)	14.90(2.81)	23.23(3.40)	*P=0.001*	Before classes and last session	Comparison of integrated method and concept map
			Meaningful learning	13.28(3.00)	23.12(2.65)	13.68(2.49)	21.14(3.42)	*P=0.001*		
			Knowledge difference	9.29(3.38)		8.33(3.50)		*P=0.36*		
			Learning difference	9.84(2.70)		8.33(3.50)		*P=0.009*		
9	Tehran et al 2011 Qom University of Medical Sciences [19]	35	Low learning level	15.56(2.29)		15.34(2.31)		*P=0.06*	End of session 8	Lecture and concept map
			High learning level	14.96(1.89)		14.85(1.39)		*P=0.001*		
10	Moattari et al/2012/Shiraz Nursing Faculty [20]	32	Overall score of mental habits Overall score of thinking skills	23.68(20.58)		6.30(5.51)		*P=0.005*	After 10 weeks (during two weeks)	Effect of concept map on critical thinking skill

increased in the intervention group (P=0.02) and scores of surface learning and self-regulated learning showed no significant difference between two groups (P>0.05). In a study with intervention for two months, there was a significant difference in the changes of meaningful learning score between two groups (P=0.03). Another study investigated the effect of concept mapping on learning scores and retention scores during four sessions of intervention, and in both cases, the positive effect of concept mapping was observed (P<0.05). Furthermore, in one other study, the efficiency of concept mapping in learning with nine days of intervention had been studied, and a significant difference was observed between score changes of concept mapping in evaluations (P<0.001).

Discussion

As the provision of service becomes more complicated and improves in field of nursing, the need for using self-learning techniques is apparent. Since the objective of nursing is professional evolution in which a person is able to self-direct and continue their educational path, so, too, the student should gain necessary abilities of self-learning. One of the most efficient strategies provided in recent years for this aim is the "concept map".[21]

Results of investigating the articles conducted on nursing education using concept maps in Iran shows that this educational method has a significant effect on the critical thinking of learners. Compared to other educational methods such as lecture, using concept maps generally shows more efficiency and the effect of deep and lasting learning and retention. Results show that concept maps have a significant and higher effect on lasting and meaningful learning; additionally, this method has been mentioned in studies as an effective method for combining previous knowledge and learning with the new. In some studies, research has also shown the positive effect of using concept maps in the bedside and clinical experiences of nurses.

One of the important areas studied in the articles is the effects of education (based on concept mapping) on the critical thinking of nursing students, where the results show the positive effect of this method. A review of texts shows that different studies approved the positive effect of using concept maps on improving critical thinking. For example, the study by Wheeler conducted on 76 fourth-year nursing students with a pretest-posttest showed that using concept mapping could help improve critical thinking in students.[11] In Taiwan, the positive effect of concept mapping on dimensions of conclusion and overall score for ability of critical thinking has been shown.[22] Similarly, in the study by Wilgis in which the effect of concept mapping in 54 nursing students was investigated, high improvement in critical thinking skills of students was observed.[23] Various studies conducted by other researchers all around the world also show the positive and significant effect of using concept maps for improving critical thinking in students and learners.[10,24-25] Despite significant evidence for the positive and significant effect of concept maps in improving critical thinking, the results of quasi-experimental study conducted by Samawi in 2006 did not show an improvement in critical thinking of nursing students.[26]

Considering the nature of concept mapping, where a network of connections between concepts and contemplation about elements of every concept is emphasized, it could be concluded that students gain critical thinking skills using concept maps. In this case, based on the idea of Toliman, using the concept maps improves the skills of critical thinking including: interpretation, analyze, evaluation and conclusion, explanation, self-organization, and self-evaluation.[27]

In most of the investigated studies, researchers compared effectiveness and results of using concept maps with other educational methods, such as conventional lecture. Generally, results show the dominance and effectiveness of most of the concept maps in most of the fields, rather than other educational methods. One of the conventional methods in education whose effectiveness has been compared in most of the studies with that of concept maps is the method of convectional lecture. In most of the conducted studies, the high dominance and advantage of using concept maps has been shown compared to the conventional lecture method.[9,28,29]

Another educational method, whose effect has been compared in some studies with that of concept map, is the integrated method. Azad Rahmani et al.[18] in Tabriz in a quasi-experimental study on 45 second semester nursing students, suggests that in cases where there is a need for deep and high-level learning, educational techniques with concept mapping concepts should be used. Some studies conducted on this field showed that both educational methods of integrated and concept maps have positive effects on improving cognitive learning of students, but the effect of concept maps in deep and high-level learning is more than that of the integrated method.[7,30,31] One of the effective factors in the higher efficiency of concept maps for deep and high level learning compared to that of the integrated method could be a result from the nature of these methods, since in education involving concept maps the student is actively involved in the subject by collecting required information from a concept map. In the integrated method, required contents are transferred in a one-way method from professor to student in terms of lecture and question and answer, and the student has a passive role in this field.

The third main field investigated in this study is the effect of concept maps on the overall learning of nursing students. Many studies approved the effect of concept maps on better learning of theoretical lessons.[18,32,33] Moreover, in different studies, the effect of concept maps on clinical education and creating an effective relationship between theoretical and practical knowledge in patient's bedside manner has been shown.[2,27,34,35] Considering the fact that using concept maps give the opportunity for students to recognize the deep and precise relationship between nurses and patients (and also since concept maps are completed before the attendance

of a nurse to a patient's bedside), this positive effect is comprehensible.

In addition to the areas mentioned above (better learning of theoretical lessons and relationship between theory and practice), using concept maps in other parts and forms of learning is also common, and the effectiveness of concept maps in these fields has also been approved. Of the most important of these forms and areas, it is possible to mention collaborative learning, relationships between various concepts, learning strategies, self-regulated learning, and the most important of all, organizing information.[10,14,21,36-39]

In spite of the positive points and effects of using concept maps, its usage in education faces a major problem, which is "lack of time," because many nurses and professors complain about their lack of classroom time and the time-consuming nature of using concept maps.[34] In this direction, using computer software for designing and forming concept maps could be troubleshooting. One of the most important and efficient of these software's is C-map Tools.

Studying articles conducted using concept maps in educational nursing show that these studies have been conducted with a low sample size and have low powers of generalization, so it is suggested to design and conduct studies with higher sample size and correct methodology. Besides, it should be mentioned that these studies which compared concept mapping methods with other educational methods generally compared concept maps with inactive methods. Therefore, it is better to compare this educational method with other active methods such as the Problem-Based Learning method and Debit-Based Learning method.

Regarding the limitation of the current study, we must mention the impossibility of conducting a meta-analysis study due to different reporting of results and non-uniformity of investigated areas of studies.

Conclusion

Based on the results of this study using concept maps in nursing education, we conclude they have a positive and effective impact in various forms and areas (such as critical thinking, relation between theory and practice, improvement of clinical experiences, organizing concepts, and self-regulating) and have more advantages and efficiency in deep, meaningful, and high-level learning compared to some inactive educational methods such as the lecture method and integrated method. Therefore, it is necessary to plan and pay more attention to the use of this educational method in the nursing education field.

Competing interests

The authors declare that there is no conflict of interests.

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