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Comparing the effect of lecture- and concept mapping based learning on cognitive learning levels

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Abstract

Aims: As the ultimate goal of professional nursing is to provide high quality care for patients in all fields (biological, psychological and social), nursing educators should use teaching methods that prevent superficial learning of students and improve meaningful and high level learning. The aim of this study was to compare the effect of lecture- and concept mapping based learning on cognitive learning levels of nursing students.

Methods: In this quasi-experimental study with pre- and post-test method, 66 fifth semester nursing students in cardiovascular course were selected by census method and randomly divided into two control and experimental groups. After performing pre-test, both groups received education using lecture and concept mapping, respectively, for 8 sessions during 2 months. Then, the post-test was taken and 4 weeks after, the recall test was performed. For gathering data, a researcher-made academic progress test consisting two parts was used. Data was analyzed by repeated measurement ANOVA method using SPSS 15 software.

Results: The procedure of total scores' change (knowledge and learning level) was statistically significant in both methods ($p<0.01$). The procedure of knowledge scores' change was not significant between two groups, but the procedure of scores' change in meaningful learning level was statistically significant in experimental group ($p<0.005$).

Conclusion: Concept mapping method is more effective in reaching meaningful learning and high levels of understanding.

Keywords: Concept Map, Meaningful Learning, Educational Methods, Lecture, Nursing Students

Introduction

At the present time that technology progresses exponentially, the society needs intelligent, creative and innovative people more than ever. One of the duties of the educational system is to train individuals who possess criticizing and creative thinking and have the ability of problem solving, those who do not accumulate information and knowledge that will be quickly outdated [1]. In line with this progress era, complexity and the rate of the nursing knowledge production is increasing steadily and nursing educators are continuously trying to teach "how learn" to the students [2]. On the other hand, as the ultimate goal of professional nursing is providing high quality care to patients in all fields (biological, psychological, social), superficial learning and incomplete information has affected the performance of nursing students in dealing with patients and has led to patients' complaint, and this is the major concern of nursing managers [3]. Therefore, to prevent such problems, nursing educators should use new teaching methods that prevent superficial learning and lead to improvement of critical thinking skills, problem solving and increased memory [2].

Concept mapping is one of the active teaching methods that can help nursing educators to train graduates who are capable of critical thinking and problem solving [4]. Theoretical framework of concept mapping teaching approach is based on meaningful learning of Ausubel. In his view, learning occurs when the learner is able to organize and relate the concepts and new information with his/her cognitive mental structures. According to the Ausubel meaningful learning theory, Novak and Gowin developed concept mapping teaching method [5, 6, 7]. Concept mapping is a schematic and two-dimensional tool for presenting a collection of concepts in the framework of propositions. In fact, concept mapping is the presentation of the association schema of a concept with another concept and their relation with other concepts related to the specific subject that is sorted in a hierarchical model [8]. The process of concept mapping is simple [7].

Concept maps are diagrams of key concepts and relationships between those concepts. The main concept is placed at the top or center and other concepts are arranged from top to bottom; some lines are drawn between concepts and the communicative sentences are written on the lines [9]. A knowledge

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that is learnt through a meaningful way such as concept mapping will be kept in mind for a longer time and this leads to improve in critical thinking skills and the ability of problem solving in nursing students [10].

There are several articles in nursing literature that suggest this method for students' theoretical training, connecting theory and clinical practice, promotion and evaluation of the critical thinking, care plan registration, course evaluation, providing of patient-centered and comprehensive cares by students [3 , 6]. The aim of this study, according to many advantages of this method and in order to promote its use in teaching nursing courses, was to compare the effect of education which is based on "lecture" and "concept map" on the cognitive learning levels in nursing students of cardiovascular nursing field. For this reason, nursing students' cognitive learning of the "cardiovascular nursing" lessons was analyzed and compared in both methods at a level lower than perception, i.e., knowledge and meaningful learning (understanding and application).

Methods

In this quasi-experimental study with a pre-test post-test design, the effect of concept mapping and lecture approach on nursing students' cognitive learning levels was examined in the theoretical course of "cardiovascular nursing", at the level of knowledge, perception and application. The study population was fifth semester nursing students studying in a nursing college of Tehran in the first semester of academic year 2009-2010 to whom the theoretical lesson of "cardiovascular nursing" was presented (n=66). Sampling was performed by census method and none the subjects had previous familiarity with concept mapping.

A pre-test was taken before beginning of the classes. Then, all students of this course were divided into two groups by simple random method. One of these two groups was considered as the control and the other one as the experimental group. An objective researcher-made academic progress test was used for data collection which tested the cognitive learning of the students in the field of cardiac nursing. The test included two parts, and had 40 questions. The first 20 questions assessed the domain of knowledge. Questions 20 to 40, measured the meaningful learning domain (level of perception and application according to the Bloom classification of cognitive objectives). Point 1 was assigned for correct answer to each question and point zero for each incorrect answer. The total test score was obtained from the total correct responses. Test validity was evaluated through content validity, in a way that the test was given to the 12 faculty members of Tehran nursing faculties who had teaching experience in the field of cardiovascular or concept mapping and after receiving their comments, the necessary changes were made. The test was given to 16 students having similar condition, who had passed this course before, in order to determine its reliability and using Kuder-Richardson 20 method, the reliability of the test was obtained as 0.7 [11].

Students of the experimental group participated a 90minutes session for instructing the concept mapping and its drawing method, before beginning of the course. In addition; a researcher-made educational pamphlet on concept mapping was given to the students. Then, "cardiovascular nursing" was instructed to the students of both groups (experimental and control) for 8 sessions in 8 consecutive weeks by the researcher using lecture and concept mapping, respectively. From the numerous materials on the Internet, the concept maps were designed and were drawn by the PowerPoint software and were handed to the faculty members of Tehran nursing college in order to determine the validity. After removing errors, the maps were used for training of the experimental group; each student had to prepare a concept map of whole presented subjects for the next session. In each session the students' maps were evaluated by the researcher and they were given feedbacks. Control group was instructed using lecture method and using PowerPoint software. Finally, after eight sessions, without any previous awareness, both groups were taken a post-test and 4 weeks after the last educational session, they were taken a recall test without any previous awareness.

SPSS 15 software was used for data analysis and inferential statistical tests such as paired t-test (for the comparison of means before and after intervention in each group), independent t-test (to compare the mean scores in both groups ordered by the test stages), repeated measurement variance analysis (for comparing the process of scores' change) and Chi-square (to compare both groups demographic characteristics) and exact Fisher test were used.

Results

60.6% of students were female and 81.8% of the total sample was single. The average age of experimental group was 21.23 ±1.40 years and that of control group was 21.21± 0.82 years. The prior semester mean of the experimental group average was 17.05± 0.94 and that of control group was 16.88± 1.02. Both groups' students had an average prior knowledge (47.7%) of

nursing and the rate of both groups' interest in nursing was at the average level (53.3%).

Fisher exact test was used to compare the sex and marital status, ANOVA test was used to compare the prior knowledge of nursing major and the rate of interest in nursing, and independent t-test was used for comparing the age and the average of previous semester of study units, which did not show any significant difference between the two groups. In both methods, the total score changing process (knowledge and meaningful learning level) was significant from pre-test to pos-test and recall test (p=0.01; diagram 1).

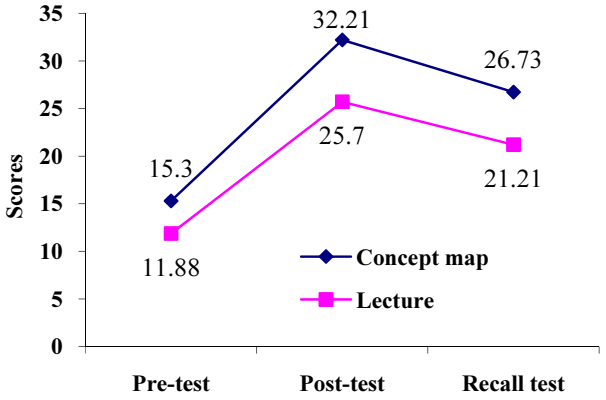

Diagram 1- Comparison of the total mean scores' changing process at different stages in both groups (p<0.01)

The knowledge level scores changing process at different stages between groups was not statistically significant (p=0.052; diagram 2).

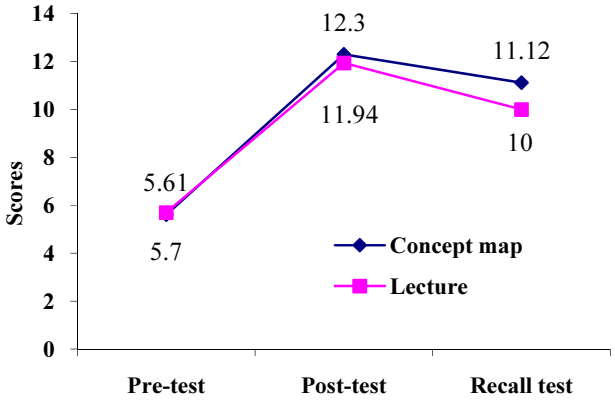

Diagram 2- Comparison of the mean scores' changing process of knowledge level at different stages of measurement in both groups (p=0.052)

While the meaningful learning mean scores changing process at different stages between groups was not statistically significant (p<0.005; diagram 3). The mean and standard deviation of learning levels in both groups are presented in table1 (Table 1).

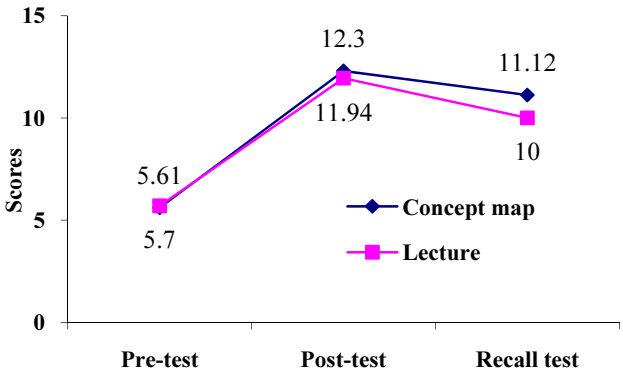

Diagram 3- Comparison of the mean scores changing process of meaningful learning at different stages of measurement in both groups (p<0.005).

Table 1- The mean and standard deviation of knowledge level score at different stages of measurement in each intervention group.

Test stages→ / Teaching method↓		Pre-test	Post-test	Recall test
		Mean±SD	Mean±SD	Mean±SD
Knowledge Level	Concept mapping	5.69±2.33	12.30±1.62	11.12±2.10
	Lecture	5.60±1.90	11.93±1.90	10±1.85
Meaningful learning level	Concept mapping	9.6±3.84	19.9±2.19	15.6±2.01
	Lecture	6.27±1.94	13.75±2.33	11.21±2.32

Discussion

The results of this research showed that concept mapping method causes more improvement in cognitive learning of nursing students in the nursing cardiovascular theoretical course than lecturing method. These results are consistent with other studies [6, 10, 11, 12].

The considerable point of this research is the effect of these two methods on cognitive learning levels including two levels of knowledge and meaningful learning (perception and application). Concept mapping and lecture methods both could promote the learners' cognitive learning but concept mapping method was more effective than lecture method on meaningful learning. The reason of this difference lies in the nature of concept mapping. Since concept mapping is an illustration of students' interpretation about ideas and concepts, it allows students to be aware of mistakes existing in their understanding and their motivation for learning and leads to accept responsibilities of their learning by themselves. Therefore, in concept mapping student has an active role in learning and since the arrangement of concepts in concept mapping is in hierarchical form and this form is highly similar to the way of arranging

information in long-term memory, it leads to the preservation of materials which are learnt by this way [6, 10, 11, 12]. On the other hand, this unique method increases the ability of accommodating new information and setting relationship between them and the pre-existing information (in a meaningful way) and also increases the survival of the information in mind and the individual's understanding [7]. However, in lecture method the learner is inactive and is just the recipient of information and does not perform any processing for information storage. Consequently, the information is not stored in a hierarchical (meaningful) way proportionate to individual's cognitive structure in this method, which causes some problems in understanding and retention of information [13]. The results obtained in this study also confirm this issue, since the students instructed with concept mapping differ with those instructed with lecture method just in meaningful learning dimension (perception and application).

To Irwin, concept mapping helps developing meaningful learning. Despite numerous benefits that were mentioned for concept mapping, this approach has some drawbacks such as other teaching methods and probably its time consuming feature is the most prominent one. In addition, use of this technique is very difficult for students at first, but gradually drawing maps will be easier for them. Many nursing instructors have knowledge about the benefits of concept mapping, but unfortunately a small number of nursing teachers use this method to design curriculum [2, 3]. Students believe that this approach promotes the learning level, critical thinking skills, problem solving, communication skills and academic progress [2, 3, 5, 6, 9].

This study, like other interventional researches has limitations, from which the most important one is the possibility of exchanging information between two groups. With regard to the listed limitations and the obtained results, a research with the same title with subjects studying the same major but in two different faculties is suggested, so that information exchange between the two groups would be impossible. In addition, it is recommended to perform some researches to evaluate the effect of individual-made and group-made on educational achievement and the use of concept mapping by students in training courses as a tool for collection of data about patients. Because of the positive effect of concept mapping on promotion of meaningful learning, critical thinking, problem solving and decision making, its use is suggested for training nursing specialty courses.

Conclusion

Concept mapping method similar to lecturing method, leads to improve in cognitive learning of nursing students, but the effect of concept mapping method on students' meaningful learning levels (perception and application) is more than lecturing method. Concept mapping improves the meaningful learning more than lecturing method.

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