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The Effect of Concept Mapping on the Learning Levels of Students in Taking the Course of "Nursing Care of Patients With Glandular Diseases Subject" in Urmia University of Medical Sciences, Iran

Nader Aghakhani [1]; Hamid Sharif Nia [2]; Samereh Eghtedar [1]; Camellia Torabizadeh [3,*]

[1]Inpatient Safety Research Center, Urmia University of Medical Sciences, Urmia, IR Iran
[2]Department of Nursing, Faculty of Nursing and Midwifery of Amol, Mazandaran University of Medical Sciences, Sari, IR Iran
[3]Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Shiraz, IR Iran

*Corresponding author: Camellia Torabizadeh, Community Based Psychiatric Care Research Center, Shiraz University of Medical Sciences, Shiraz, IR Iran. Tel: +98-7136474254, E-mail: camellia_torabizadeh@yahoo.com

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Background: Studies show that traditional teaching methods, such as lecturing, do not lead to in-depth learning. Concept maps have been used for a long time by researchers and teachers to facilitate learning.
Objectives: The present study aimed to investigate the effect of concept mapping on the learning levels of students in nursing care of patients with glandular diseases subject in Urmia University of Medical Sciences.
Materials and Methods: In a quasi-experimental study with a pre-test/post-test design, 28 nursing students were selected and divided into two groups: the experimental and the control groups. After administration of pre-test, the students in the experimental group participated in classes on designing concept maps. Next, lessons on glands and nursing were presented to the students in the experimental and control groups through concept maps and lectures, respectively. At the end of the semester, the learning levels of the students in both groups were evaluated by the post-test.
Results: The means of the scores of the students as determined by results of the pre-test revealed insignificant statistical difference between the two groups. However, the learning level of the students in the experimental group was significantly higher ($P < 0.05$). As a metacognitive intervention, concept mapping can contribute to in-depth learning of nursing students.
Conclusions: According to the findings, it is recommended that concept mapping should be used for teaching and evaluation. Further studies are needed to compare the effect of concept mapping with those of other metacognition approaches on different types of learners.

Keywords: Learning; Nursing; Thinking; Iran; Concept map

1. Background

Nursing education is expected to improve problem solving, decision making, and critical thinking abilities of nursing students in different circumstances (1). With the advancement of science, there is a constant increase in the amount of available daily information, which is sometimes called information explosion. Accordingly, students need to actively receive the most recent information, to face future problems with the tools made available by the newest technologies. The deeper and more long-lasting the knowledge of the students, the more effectively they can explain and apply it in reality, which makes them more eager learners (2).

Nevertheless, the teaching methods commonly practiced at colleges and universities provide students with theoretical knowledge only and do not prepare them for the real challenges they are going to face. The traditional education does teach the students a certain amount of information, but it does not equip them with the tools to analyze, prioritize, and organize new information required for effective learning. Therefore, it is important to change the roles of universities, as mere warehouse of knowledge, and teachers, as mere lecturers and transfers of knowledge; instead of merely learning and memorizing, students should improve their thinking and inference skills and learn how to analyze information and use it (3). Concept mapping is an active teaching strategy, which can improve teaching and learning quality, and facilitate and promote critical thinking in education and evaluation. The use of concept mapping to improve critical thinking skills was among the identified recommendations (4).

As a student-centered approach, concept mapping allows learners to learn the new information based on what they have already learned by connecting concepts through linking words. The strategy of concept mapping not only increases students' knowledge, but also equips them to organize concepts in a network of multiple connections throughout the whole learning process, from making schedules to preparing for exams (5).

Concept maps encourage learning and bridge the gap between the formerly and newly taught lessons in

learners; they act as facilitators in education and evaluation (6), and help learners see the whole picture of the available information about a subject and thus reduce confusion (7). Concept maps can be successfully used to teach conceptual thinking that increases students' competence in critical thinking in the modern teaching (8). Concept mapping can be applied as both educational and research techniques and contribute to learning (9). As a metacognitive technique, concept mapping teaches nurses how to learn (10) and helps them acquire the necessary information to analyze and design cares according to patients' conditions. Most studies on the effects of concept mapping address learners' scores or educational progress; others address the effects of concept mapping on critical thinking; few studies address the effects of concept mapping on learning (11).

The effect of concept mapping on the students' achievement and interest (12) and self-efficacy (13) is previously shown. In a recent research, concept mapping was used as a teaching strategy to develop critical thinking skills of eight undergraduate nursing students. The researchers designed concept mapping to help students develop appropriate clinical skills. Qualitative evaluation of concept mapping activity showed that the students approached this method and evaluated it as a better clinical decision making and technique (14).

A concept map is a graphic presentation of the connection between two concepts, and the way they are connected with other concepts in a subject. In order to understand a concept, a learner can design a concept map about it (15). During the process of designing a concept map, a learner will discovers many potential connections among the existing concepts and becomes mentally involved in deciding which concepts to choose and how to connect them. Such a process leads to high cognitive function, since to design a concept map, advanced cognitive acts such as analyzing, combining, and evaluating are required (16).

As an occupation that is based on in-depth learning, nursing should employ teaching strategies that relate theoretical education to clinical training. Improving clinical training and education, and equipping nursing students with problem-solving strategies have always challenged nursing education. As the science of nursing advances and becomes more complex, nursing educators should apply strategies in clinical training that will help nurses learn more effectively. To that end, educators have to employ the most recent teaching techniques, among which concept mapping helps learners understand concepts more deeply by designing their concept maps (17). Nursing educators should replace the traditional teaching methods with methods that are more effective and long-lasting, as opposed to superficial, learning.

2. Objectives

This study aimed to compare the effect of concept mapping on the learning levels of students in the nursing care of patients with glandular diseases subjects in Urmia University of Medical Sciences, Iran.

3. Materials and Methods

An interventional quasi-experimental study with a pre-test/post-test approach was carried out, which aimed to assess and compare the effects of concept mapping and lecturing in two groups of nursing students who were taking nursing care of patients with glandular diseases at Urmia University of Medical Sciences.

The study subjects were two groups each including 14 nursing students who were taking nursing care of patients with glandular diseases in the first semester of 2011-2012. Only those who were taking the course for the first time were qualified for the study. None of the students in either group was familiar with the method of concept-mapping, and if a student in the experimental group did not attend the entire classes on designing concept maps, he/she was disqualified for the study. At the beginning of the study, the pre-test was given to both groups; the students in the experimental group were given lessons on designing concept maps, two sixty-minute sessions, before they took their classes. The lessons included steps of studying a topic closely and pinpointing the key points, choosing the primary and secondary concepts that should be included in a map, prioritizing the concepts and putting them in boxes in as few words as possible, establishing the relationships among concepts by arrows and using descriptive phrases to explain connections, causes, characteristics and examples. The students were asked to prepare a concept map of a topic of their own choice, at the end of each session, and then improve it with the help of the teacher. The students were also provided with a pamphlet about concept mapping taken from valid sources.

Subsequently, the students attended lectures on diabetes and nursing in two sessions by the same teacher and syllabus to ensure an even distribution of all the effective factors in the quality of education influenced by the teacher. At first, the subjects in the experimental group were asked to design a concept map of the objectives of the lessons they had been taught. At the end of the second session, both groups were given one and the same multiple-choice test to assess their cognitive understanding of the headings of the course. To add to the credibility of the assessment, the content validity, criterion validity, discriminative validity, and inter-rater reliability of the test were verified. To verify the content validity, five members of the college academic board were consulted. The extent to which the judges agreed about the inclusiveness of the test regarding the content and objectives of the course formed a validity index. To determine the criterion validity, the correlation coefficient between the results of this test and another test was used. To verify the discriminative validity, the study used the difference be-

tween the upper and lower groups in terms of educational progress in the test. The agreement coefficient among the scores determined by five raters was used to establish inter-rater reliability.

For ethical codes, the participants were assured of the privacy of their information and that their names were not required. They were also assured that the findings would be used only for scientific purposes. The students' learning approaches in the experimental and control groups were assessed both before and after the test. Since there was no significant difference between the two groups regarding the assessed approaches in the pre-test, interpretations were based on the results of the post-test. The different sections of the questionnaire were scored according to different criteria; next, the results were coded and analyzed using the software program SPSS version 19. To compare the means of the scores on the pre-test and the post-test, the paired t-test was applied. In the current study, the significance level was considered < 5%.

4. Results

The 36 nursing students participating in the current study were divided into two groups of 18; each group included ten females and eight males. The mean of the age in the experimental and the control groups were 21 ± 1.3 and 21 ± 2.2, respectively. The mean of the high school grades in the experimental and the control groups were 17.35 ± 1.18 and 17.13 ± 2.09, respectively. The statistical tests of chi-square and independent t tests did not reveal a significant difference between the genders, ages, and means of grades of the two groups ($P > 0.05$). The results showed that within the groups, there was a significant difference between the pre-test and post-test scores on the knowledge and meaningful learning tests, which signified that both teaching approaches had contributed to the students' knowledge and meaningful learning. The results also showed that the post-test scores on the knowledge in the experimental group were higher than those of the control group; although the independent t-test did not reveal a significant difference between the scores, the post-test scores on the meaningful learning in the experimental group were significantly higher than those of the control group ($t = 2.27$), ($P = 0.04$). An analysis of the differences between the means of the scores before and after teaching in the groups showed that the difference between the pre-test and the post-test results on knowledge and meaningful learning were greater in the experimental group. It can be concluded that, even though both approaches contributed to the learners' knowledge and meaningful learning, concept mapping was more effective than lecturing in encouraging meaningful learning.

5. Discussion

Learning happens when there is a logical relationship between the prior knowledge of the learner and the new information. If a learner has no relevant prior knowledge, the new information will be learned passively. Meaningful learning happens in various ways such as the relationship between one topic and another or a topic and an approach. Learning will not happen unless it is made meaningful (18). In addition to being a helpful technique to facilitate learning and bring about advanced meaningful learning, concept mapping can also be used as a teaching approach in addition to problem-solving skills, and greater and longer cognition and quicker review. It can also be helpful in planning an educational program and establishing the relationship among the various parts of the education and the priorities (19). Concept mapping can be employed as an advance organizer before or during education; after education, it can act as an organizer and transform the information into a meaningful whole. Information can be summarized without a reduction in meaning or complexity by concept maps (20).

Before a course begins, the students may be asked to design a concept map based on the required pre-knowledge for the lessons to evaluate the chances of their success to achieve the objectives. Concept maps can be employed for continual (evolutional) evaluation as the learning evolves in order to assess the quality and quantity of the learning among learning. Concept maps can also be used as a tool for final evaluation; however, there is disagreement regarding this function of concept maps (21).

The results of the current study showed an increase in learning in both the experimental (subject to concept mapping) and the control groups (subject to lecturing); however, concept mapping encouraged meaningful learning much more than lecturing. It can be concluded that the higher scores in the experimental group showed that concept mapping technique was more effective than lecturing. These results agreed with the findings of Masoumy et al. (22) and Abbasi et al. (23).

In similar studies, concept mapping and lecturing increased learners' knowledge compared to the results of the pre-tests. The positive influence of lecturing may be due to the teachers' clear explanations, organized presentation of the material, and the students' active participation or habits of note-taking. The result that concept mapping contributes to learning agrees with the findings of Chularut et al. (13) and Beitz (24).

Accordingly, it can be said that modern educational approaches are more effective than the traditional ways to make learning long-lasting. A study of the students' learning in a course on nursing procedures in Tabriz, Iran, showed that the use of concept mapping resulted in in-depth and lasting learning (25). In the current study, concept maps were presented by the teacher to help the learners quickly understand the key points and the relationships among them and interpret the concepts-sometimes what a picture says is clearer than a thousand words. As shown in the current study, concept maps also help to organize courses and thus facilitate learning (23). It should be noted that learners should not be given the answers, but be presented with the problems and situa-

tions and told to discover the relationships and answers on their own; in other words, the educational programs should motivate learners to participate actively in the learning process (26).

It is obvious that mere presentation of concept maps by teachers cannot lead to long-lasting and meaningful learning. Concept mapping leads to long-lasting learning only when students design the maps, choose the key points, analyze, prioritize and evaluate information and locate the concepts on the map after careful reasoning. It is important that students participate actively in the process of learning, deal with the various concepts and facts and locate the new information based on their prior knowledge; when students consciously place the information in their cognitive structures it results in deeper learning in advanced levels (23). In lecturing, however, information mostly flows from teachers to students: using the words and concepts existed in their own cognitive structures; teachers try to shape the cognitive structures in students. In this situation, it is highly probable that the incoming information does not agree with the prior knowledge present in the learners' cognitive structures, and consequently learners may face incomprehensible relationships in their cognitive structures (8).

The results showed that students who were subject to concept mapping were more successful at meaningful learning than the students who only attended lectures. According to a similar study, while designing concept maps, students use self-supervised techniques which encourage critical thinking: students correct their own cognitive errors and organize and prioritize information again. This process leads to long-lasting learning and active participation in subjects (27). This understanding confirms the findings of the current study. Another similar study on the influence of concept mapping on the nursing students' critical thinking abilities revealed that the total score and analysis score significantly increased in the experimental group, while in the control group evaluation score significantly increased but their analysis score significantly decreased (28). Likewise, in another study of new educational approaches, the performance of a group of students taught using modern methods was compared with that of another group taught using the traditional approaches; the results showed that approaches that encourage critical thinking improve the level of learning (29). This result corroborates the findings of the present study.

In nursing education, concept maps can be used to provide patient-centered care and holistic care, prepare nurses for clinical action, and bridge the gap between theory and practice (30). Even though concept mapping and lecturing can both contribute to learners' cognitive learning, concept mapping induces meaningful learning more than the common approaches. The reason for this superiority could be that before a learner can design a concept map, he/she has to gather information about the subject in question and then organize and classify that information. In view of the nurses' important role in the health system, it is essential that they be equipped with meaningful and long-lasting learning as well as critical thinking and problem-solving skills. To develop such skills among nursing students, educators can employ concept mapping as an active teaching method which encourages students to actively participate in information analysis (22). Concept mapping proved helpful in teaching abstract concepts, which most learners find difficult to grasp, and courses that are replete with various concepts, such as basic medical and nursing lessons. There is an increasing number of academic and practical books and papers on the use of this approach in the improvement of a meaningful learning of these courses (31).

According to the findings of the current study, in view of the effective role of concept mapping in educational progress, better and more purposive learning and higher motivation for learning, it is recommended to use concept mapping for teaching and evaluation. One of the major limitations of the current study was the small number of participants, which limited the generalizability of the results. Since the present study compared the effect of concept mapping with those of the traditional approaches, it is suggested that future studies compare the effect of concept mapping with the effects of other metacognitive approaches on different types of learners.

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Authors' Contributions

Nader Aghakhani: design and coordination of the study, manuscript editing, and data analysis; Camellia Torabizadeh: manuscript preparation, translation, and revision; Hamid Sharifnia and Samereh Eghtedar: study design, manuscript preparation, and data gathering assistant. All authors read and approved the content of the manuscript.

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