Original Article

Evaluation of the Effect of Concept Map Educational Method on Nursing Students' Perception of Teaching-Learning Conditions: A Quasi-experimental Study

Shadi Dehghanzadeh[1*]

[1] Nursing Department, college of Nursing and Midwifery, Rasht branch, Islamic Azad University, Rasht, Iran.

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***Corresponding author:**
Shadi Dehghanzadeh, Nursing Department, college of Nursing and Midwifery, Rasht branch, Islamic Azad University, Rasht, Iran.

Email:
shadidehghan90@iaurasht.ac.ir

Abstract

Background & Objective: A concept map is recognized as a beneficial tool that can lead to course content comprehension through information processing. There is limited research on the use of concept mapping in the clinical education of nursing students. Therefore, the present study aimed to evaluate the effect of the concept mapping method on nursing students' perception of teaching-learning conditions.

Materials & Methods: This was a quasi-experimental study with a posttest performed on 84 nursing students who received the special nursing apprenticeship credit. The students were divided into two control (n=40) and experimental (n=44) groups by simple random method. The content of the course of patient care process design in CCU was taught to the subjects in the control and experimental groups by the conventional (columnar) and concept map methods, respectively. Data were collected using a two-section questionnaire encompassing demographic characteristics and the experiences of the teaching and learning questionnaire (ETLQ). In addition, data analysis was performed using descriptive and analytical methods such as independent t-test and one-way ANOVA.

Results: In this study, there was a significant difference between the two groups regarding the scores of four subscales of organization and structure, teaching and learning, students and teachers, and assessment and other set work and overall ETL score.

Conclusion: It is suggested that the concept map method be used as a beneficial technique in the area of nursing students' clinical education.

Introduction

There has been a recent emphasis on strengthening teaching-learning environments and applying inclusive teaching methods in universities (1). In a 3P model, which encompasses presage, process and product, Biggs (1989) conceptualized the learning process in the form of interaction of three variables, including learning environment and learner's characteristics (situational factors), inclusive learning approach and learning outcomes. According to this scholar, a key part of practical use of the model is this assumption that learners' perceptions of learning conditions along with their motivations and expectations affect the learning approaches and outcomes. Studies have been conducted to evaluate the relationship between the learning of students and their perception of the teaching-learning conditions in various disciplines, including pharmacy, veterinary medicine, law, agriculture, art, as well as behavioral and social sciences (2-4). These studies mostly focused on the correlation between the learning of students and their perception of the teaching and learning conditions and methods. In most studies, students considered proper education to be associated with their satisfaction and successful learning in higher education (5, 6). Learners' experience and perception of the learning conditions affect their learning outcomes, directly and indirectly,

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meaning that improper teaching and evaluation methods can lead to surface learning and a positive experience of the learning environment can result in deep learning (5).

The nursing students' learning conditions and environment include classrooms and the clinical environment. In fact, nursing students acquire the theory principles of patient care in classrooms and use them in the clinical learning environment, where patient care and their critical thinking are assessed (7). This environment must prepare the conditions to use theory in practice and help nursing students to be turned into competent healthcare providers (8). In this regard, one of the competencies of these individuals is planning for nursing care or nursing processes (9). Nursing graduates will be prepared for performing their job duties if equipped with the necessary skills. Meanwhile, evidence shows that nursing graduates are not sufficiently prepared for starting their careers due to a lack of critical thinking and managerial skills (7). Those who lack the necessary preparedness and competencies often leave the nursing career due to stress and burnout (10). Therefore, educational planners of the field must prepare a clinical learning environment that can provide an opportunity to achieve educational goals (8). In this respect, the educational method is one of the fundamental issues in preparing a favorable clinical training environment and conditions. In fact, nursing managers must manage a learning environment by using inclusive educational methods such that critical thinking could be nurtured in students (11). Nonetheless, many universities still use conventional training methods (12). A concept map is an effective training and learning strategy for instructors and students, which visually evaluates what the student is learning. Through the concept map process, a learner can evaluate their knowledge level and learn to use critical and complex thinking instead of linear thinking (13). Novak developed concept maps based on Ausubel's theory of cognitive learning, where learning is defined as a new knowledge absorption process (14). In a concept map, the most general and inclusive concepts are positioned at the top with the more specific and exclusive concepts arranged hierarchically below. The learner adds new concepts to their cognitive structure by establishing specific lateral connections between concepts. Meaningful learning occurs through the assimilation of new concepts with the preexisting ones (14).

Various studies have been conducted on the effect of the concept map method on nursing student learning in theory and clinic areas. Kaddoura et al. and Lee et al. evaluated nursing students in courses of pathophysiology, pharmacology and internal surgery, reporting that concept map improved critical thinking in students (15, 16). In a study by Karns, meaningful learning was higher in nursing students who learned through concept map, compared to students who were trained by traditional methods (17). In addition, Aein & Frouzandeh and Zare & KargarJahromi evaluated concept map learning in clinical education of pediatric nursing students and training of critical care nurses (18, 19).

Despite various studies on the use of concept maps in nursing education, no study was found on the evaluation of nursing students' perceptions of learning conditions using a concept map in clinical education. Meanwhile, nursing managers must use educational methods to improve deep learning in students by creating a positive experience of the educational environment. With this background in mind, this study aimed to evaluate the effect of the concept map education method on nursing students' perception of teaching-learning conditions.

Materials and Methods

This was a quasi-experimental study performed after receiving a code of ethics from the committee for ethics in biomedical research, Islamic Azad University, Rasht Branch (code: IR.IAU.RASHT.REC.1396.158). The study was performed in 2018-2019 with two groups and a

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posttest. The research population included 92 six-semester nursing students, who achieved the special nursing apprenticeship credit. However, eight guest students were removed from the research due to being already trained in other centers. Students of Rasht Branch (n=84) were divided into 11 six to nine-member groups from the beginning of the apprenticeship course. The remaining 11 groups were allocated to five control groups (n=40) and six experimental groups (n=44) by simple random sampling and lottery method. One of the students of the control group was eliminated from the research due to an absence from the apprenticeship course. The inclusion criteria were being a sixth-semester nursing student of Islamic Azad University, Rasht Branch, receiving a special apprenticeship credit, lack of experience of learning through concept map and consent to participate in the study. On the other hand, the exclusion criteria were absence from the apprenticeship course and incomplete questionnaires. In this study, the CCU apprenticeship course was trained using a conventional method (columnar design of the nursing process) and a concept map to teach how to design a nursing care program.

In the control group, the students performed all the relevant nursing care by designing the nursing process in a columnar manner under the supervision of the instructor. In the columnar method, the nursing process is divided into five columns of nursing diagnosis, goals, planning, implementation and design. In order to implement the concept map method, a workshop was held for the students of the experimental group. The purpose of this workshop was to familiarize students with the method of the concept map. The workshop lasted for two hours and its educational content included learning methods in medical students, the definition of the concept map and its components, theoretical foundations of concept map, benefits of using concept map, design of concept map and implementation of teamwork (design of nursing process program using a concept map and information related to the case presented by the instructor). Students were obliged to design six concept maps during the apprenticeship course. To design a nursing process program by concept map, students determined patients' medical diagnosis and evaluation of signs and symptoms along with recording risk factors, tests and medications, nursing diagnoses, prioritization of nursing diagnoses, goals, nursing interventions, and evaluation and communication between different parts of the concept map. During the next days of the apprenticeship, the learners' initial concept maps were discussed in group discussion sessions, and the maps were completed with the guidance of the instructor and based on the opinions of other students. This activity allowed students to deliberate about and express the accuracy of the connections between the concepts designed in their maps. They used different shapes and colors to codify different parts of the nursing process and explained the key to explaining the coding in their concept maps.

After designing a concept map for the respective patients, students had a few days in the apprenticeship to evaluate the effectiveness of the nursing interventions designed by them before completing the concept maps. After gaining experience in designing the first concept map, the students designed five other concept maps, which were designed for patients with cardiac arrest, cardiac failure, endocarditis, pericarditis, pericardial effusion, acute coronary syndrome, atrial fibrillation, atrial fibrillation tachycardia and ventricular tachycardia. Table 1 shows the education method of the two control and experimental groups. Data were collected using a two-section questionnaire; the first section included demographic characteristics such as age, gender, marital status, and occupational status.

In addition, the second section encompassed the experiences of the teaching and learning questionnaire (ETLQ). This questionnaire is one of the several tools designed to assess learners' perceptions of learning environments (1), which is

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one of the tools applied to assess students' perception of learning environments (1). The ETLQ has been designed to measure the effect of education and learning environment changes on the learning approaches of students with the main focus on education and learning in a course credit (20). The tool was designed in England as part of a research project to determine the components of the teaching-learning environment so that learners could be supported regarding participation in research and learning in higher education (21). The project led to the development of the long (77 phrases) and short (40 phrases) forms of the ETLQ (4). In the present study, we applied the short form of the tool, which includes 40 phrases divided into four subscales of organization and structure, teaching and learning, students and teachers, and assessment and other set work. The subscale of organization and structure encompasses three subscales of aims and organization, alignment and choice. On the other hand, the teaching and learning area includes three subscales of teaching and understanding, awareness of learning skills and ways of thinking, and evoking interest and enjoyment. The area of students and teachers comprises of two subscales of teachers' enthusiasm and responsiveness to students and climate and relationship. Finally, the area of assessments and other set work includes the subscales of alignment and clarity, focusing on understanding, and supporting learning and awareness of learning skills (21).

The questionnaire has been applied in various areas, including nursing (2, 22-24). The instrument's items are scored based on a five-point Likert scale, from completely disagree (score=1) to completely agree (score=5). In addition, the highest and lowest scores in the areas of organization and structure, teaching and learning, students and teachers, and assessment and other set work are 8-40, 15-75, 7-35, 10-50 and 40-200, respectively. The forward-backward process was used to translate the instrument. For this stage, we asked two faculty members especially in medical education and proficient in English to translate the questionnaire into Farsi. Slight changes were made in the tool following cultural and educational adaptation. For instance, the word staff was replaced by the teacher due to the lack of use of nurses working in hospitals in the education of nursing students in Iran. In the next stage, two English translators, who had no information of the original version of the tool, re-translated it from Farsi to English by back-translation method and compared it with the original version to ensure the compatibility of the translated version with the original version. Content validity was used to evaluate the tool's validity by providing the questionnaire to 10 education experts of Guilan and Tehran universities of medical sciences. The process involved comparing the phrases in terms of appropriateness and relevance. In addition, the tool's reliability was confirmed at a Cronbach's alpha of 0.92. The instrument was filled by all students of the two groups at the end of the apprenticeship course. Data analysis was carried out in SPSS version 25 using descriptive statistics (frequency distribution, mean and standard deviation), analytical methods such as independent t-test (to compare ETL and its areas in the two groups and the relationship between gender, marital status and occupational status with ETL) and one-way ANOVA (to evaluate the relationship between age and ETL), and parametric tests such as Smirnov- Kolmogorov Test (to evaluate the normal distribution of the data) due to a P-value above 0.05 and normal distribution of the data.

Table 1: Educational program of control and experimental groups

days of the apprenticeship	Educational program	
	Experimental group	**Control group**
First day	Orientation	Orientation
	An overview of the concept map	An overview of the column nursing process
Second day	Designing nursing care plan for ASC using concept map	Designing nursing care plan for ACS using column method
	Group discussion: normal ECG	Group discussion: normal ECG
	Drug discussion: nitrates	Drug discussion: nitrates
Third day	Designing nursing care plan for MI using concept map	Designing nursing care plan for MI using column method
	Group discussion: ACS and MI ECG	Group discussion: ACS and MI ECG
	Delivery of two concept maps by students	Delivery of two column nursing process by students
Fourth day	Designing nursing care plan for HF using concept map	Designing nursing care plan for HF using column method
	Group discussion: evaluation of students' concept map	Drug discussion: betablocker, calcium blockers and narcotics
	Drug discussion: betablocker, calcium blockers and narcotics	
Fifth day	Designing nursing care plan for endocarditis, myocarditis and pericarditis using concept map	Designing nursing care plan for endocarditis, myocarditis and pericarditis using column method
	Group discussion: evaluation of students' concept map	Visit echocardiography and exercise test department
	Visit echocardiography and exercise test department	
Sixth day	Designing nursing care plan for supra ventricular arrhythmia using concept map	Designing nursing care plan for supra ventricular arrhythmia using column method
	Group discussion: evaluation of students' concept map and ACS and MI ECG	Group discussion: ACS and MI ECG
	Delivery of two concept maps by students	Delivery of two column nursing process by students
Seventh day	Designing nursing care plan for ventricular arrhythmia using concept map	Designing nursing care plan for ventricular arrhythmia using column method
	Group discussion: evaluation of students' concept map and heart blocks	Group discussion: heart blocks
	Drug discussions: thrombolytics and anticoagulants	Drug discussions: thrombolytics and anticoagulants
Eighth day	Group discussions: evaluation of students' concept map and CPR	Group discussions: CPR
	Drug discussions: antiarrhythmics	Drug discussions: antiarrhythmics
	Delivery of two concept maps by students	Delivery of two column nursing process by students
Ninth day	Cumulative evaluation	Cumulative evaluation

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Results

In this study, most students were female (84.3%) with a mean age of 21.84±1.16 years. In addition, the majority of the participants were single (90.4%) and were unemployed (77.1%). Overall, the two groups were homogenous in terms of demographic characteristics (Table 2). Table 3 shows the results of the comparison of the two groups in terms of ETL and its subscales, revealing that the mean scores of the four subscales of organization and structure, teaching and learning, students and teachers, and assessment and other set work and total ETL score were higher in the experimental group, compared to the control group, and the difference was statistically significant. However, there was no relationship between the demographic characteristics of the participants and ETL (Table 4).

Table 2: Demographic characteristics of control and experimental groups

characteristics		Control group	Experimental group	p-value
Age		21.97 ± 1.28	21.73 ± 1.04	P=0.927
Sex (percent)	female	76.9	90.9	P=0.129
	male	23.1	9.1	
Job (percent)	Employed	23.1	22.7	P=0.587
	Student	76.9	77.3	

Table 3: Comparison of ETL and its subscales in control and experimental groups

ETL	Group	Mean(SD)	t	p-value
Organization and structure	Control	31.53(2.74)	-5.27	P<0.001
	Experimental	34.54(2.45)		
Teaching and learning	Control	55.82(7.73)	-7.55	P<0.001
	Experimental	66.72(5.31)		
Students and teachers	Control	26.35(3.32)	-6.69	P<0.001
	Experimental	30.61(2.44)		
Assessment and other set work	Control	38.48(3.56)	-8.75	P<0.001
	Experimental	44.88(3.08)		
Total ETL	Control	148.03(14.55)	-8.92	P<0.001
	Experimental	172.27(10.02)		

Table 4: Relationship between the demographic characteristics of the participants and ETL

demographic characteristics	Test	Test statistics	p-value
Age	ANOVA	F=0.253	P=0.777
Sex	Independent T	t=0.320	P=0.894
Marriage	Independent T	t=-1.494	P=0.488
Job	Independent T	t=-0.335	P=0.861

Discussion

According to the results of the present study, students taught by the concept map had a more positive perception of learning conditions, compared to the control group. In addition, students learned by the concept map had a more positive perception of the learning conditions in four subscales of organization and structure, teaching and learning, students and teachers, and assessment and other set work, compared to the control group. In this regard, our findings are in line with the results obtained by Mohamed and Ahmed (2019), who concluded that nursing students, who learned evidence-based nursing by concept map method, had a positive viewpoint toward the technique. Most of them considered this method to be dependent on understanding and using the material rather than memorizing, recalling and remembering them. They believed that the method could be used to achieve skills such as strengthening self-learning skills, filling gaps in professional practice, acquiring research skills, acquiring critical assessment skills, strengthening problem-solving and critical thinking skills, and strengthening patient involvement in clinical decision-making (25).

In explaining learners' perceptions of teaching-learning conditions using the concept map method, it could be expressed that according to the dual coding theory by Paivio (1986), concepts and information are stored and encoded in memory both verbally and visually, and simultaneous verbal and visual processing occurs effectively. Therefore, content that can be decrypted in both ways is easier to learn. In coding theory, the use of images along with lectures and texts can improve memorization and knowledge transfer. According to this theory, a concept map, which comprises images that can help students recall prior knowledge related to the concept and code the concept as an image, can facilitate learning. Moreover, visual representation of information helps to integrate the knowledge structure of learners (26). Concept maps organize and integrate existing knowledge in a hierarchical structure and thus promotes students' academic achievement (27).

Our findings could also be explained based on Ausubel's verbal learning theory, which defined the meaningful learning properties. In general, concept maps display content as a pyramid structure of information in the mind and show the relationships between concepts and subjects from whole to part. In addition, this technique is one of the most effective ways to connect new content with existing cognitive structures. Novak believes that the concept map can help students interpret, organize and structure knowledge as relevant and coherent concepts in their cognitive structure with the help of what they already knew. They identify important concepts, determine internal relations between them and focus on meaningful learning (14). Since nursing students are concerned about the relevance of knowledge to prior knowledge, as well as with its application in reality and in a variety of clinical situations, they are interested in educational strategies that help perpetuate the knowledge gained (28).

In the current study, the students in the experimental group had a more positive viewpoint in the subscale of organization and structure, compared to the control group. In this respect, a mixed-method study was performed to evaluate nursing students' attitudes and satisfaction with the use of the concept map method. In the foregoing research, one of the themes of the qualitative section was "management and organization criteria", which included three sub-themes of providing a list of problems, providing goals and planning, and implementation and evaluation. Most of the subjects declared that the educational method allowed them to organize the educational content (29). In a study, Junior et al. evaluated the design of a concept map related to the assessment of rheumatic patients in the physiotherapy course. According to the students, the mentioned educational method was recognized as a factor for improving learning, which can be used to organize concepts related to patient evaluation (30).

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In another research by Mohamed and Ahmed, the relationship between the concepts of the concept map was significant from the perspective of students, and they were educated in an organized manner (25).

Regarding the teaching and learning subscale, the results were indicative of higher scores obtained by the students of the experimental group, compared to the participants of the control group. It was believed that the concept map method helped comprehend the content, strengthened learning and thinking skills and evoked interest in students. In the mentioned research, most students believed that the concept map method could facilitate comprehension of concepts by putting together evidence-based nursing steps and summarizing the course content. Moreover, the concept map method contributed to the memorization and study of information and saving time (25). In a study, Abdi et al. compared the effect of the basic life support teaching program taught in two concept maps and lecture methods on nursing students. In the end, it was concluded that the knowledge level of the concept map group was higher immediately and one week after education, compared to the lecture group (31). This is mainly due to the fact that students experience a change in the learning process in the inclusive and participatory education of learners (32). As an inclusive approach, the concept map promotes students' learning and engagement, encourages them to know what they need to learn and how to learn, and allows them to become aware of their abilities and learning process.

Perception and motivation increase when there is a chance to focus on the teaching and learning process because students are evoked to play an active role in the learning process in such environments (33). The overall scores of two subscales of teachers' enthusiasm and responsiveness to students and climate and relationship were higher in the experimental group, compared to the control group. In other studies, some students believed that the method turns all attention to educational concepts and strengthens the skill of communication with others and self-learning. In addition, it improves group work and enhances self-confidence in students (25). Overall, the concept map method is a participatory and collaborative learning strategy. Concept maps are usually designed in small groups of learners using each other's opinions, which improves communication between students. In this regard, Haymovitz et al. conducted a study on relationships of students, mentioning social coordination and empathy and support among classmates (34).

In the current research, concept maps were displayed in apprenticeship groups and students exchanged opinions about the maps and their strengths and weaknesses in addition to providing an opportunity for students to communicate with each other to design the map. Assessment and other set work scores, which consisted of three subscales of alignment and clarity, focusing on understanding, and supporting learning and awareness of learning skills, were higher in students trained by the concept map method. In this regard, Oncu and Cakir hypothesized that novel educational methods allow students to have self-guided education. According to these scholars, teachers are turned into learning process facilitators, who support students' learning (35). Various studies have shown that the concept map method can improve comprehension of course content, meaningful learning, rethinking and strengthening of clinical reasoning and critical thinking skills of nursing students (15, 36, 37). One of the major drawbacks of the present study was lack of a pretest to ensure the similarity of the viewpoints of the two groups before the apprenticeship. Another limitation was the lack of information for ensuring homogeneity of the two groups based on variables such as academic performance and students' interest in nursing, which might have affected the results. Given the limited number of teachers, it was impossible to evaluate the experiences of all teachers regarding the use of the concept map method.

Conclusion

According to the results of the present study and students' perception of the use of the concept map method, it is recommended that this technique be applied as a beneficial education strategy in nursing training. Moreover, nursing education planners are encouraged to familiarize nursing teachers with the method by holding relevant workshops and apply the method to teaching hospital apprenticeship courses.

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Conflicts of interest

There is no conflict of interest in the present study by the authors.

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