

The effect of education through conceptual mapping on critical thinking of nursing students

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Abstract

Objective: To determine the effect of conceptual mapping on nursing students' critical thinking.

Methods: The quasi-experimental case-control study was conducted from April 2015 to October 2016 at the University of Medical Sciences, Shiraz, Iran, and comprised students of Fatemeh-Zahra School of Nursing and Midwifery, Shiraz. The students were randomly assigned to intervention and control groups. Baseline data was collected using a two-part questionnaire, including demographic items and California Critical Thinking Skills Test. Both groups underwent 24 six-hour training sessions 3 times a week. The intervention and control groups were trained by conceptual map and integration methods, respectively. Post-intervention data was collected using the same questionnaire and was analysed using SPSS 13.

Results: Of the 81 subjects, 41(50.6%) were in the intervention group and 40(49.4%) in the control group. The mean age was 25.12±3.71 years in the intervention group and 25.5±4.10 years in the control group ($p>0.05$). At baseline, there was no significant difference between the mean critical thinking scores of the two groups ($p=0.781$). Post-intervention values increased in both groups, but the mean critical score was significantly higher in the intervention group ($p<0.0001$).

Conclusion: Concept mapping was found to be an effective approach for improving students' critical thinking skills.

Keywords: Critical thinking, Nursing students, Nursing process, Concept mapping. (JPMA 69: 1094; 2019)

Introduction

Recent advances in pedagogy have created changes in nurse education. Educational theorists believe that approaches promoting meaningful learning enhance students' critical thinking and creative thinking skills.¹ Critical thinking skills are necessary competencies that improve nurses' clinical decision-making abilities, specially in complex situations that they frequently encounter in patient care.² Critical thinking is a purposeful cognitive process in which an individual analyses the available data to make judgments and decisions.³⁻⁵ Some of the authorities and theorists in nursing education believe that conventional teaching approaches are not much effective in preparing the nurses for today's dynamic and flexible clinical settings.^{6,7} Nurse managers also worry about new nursing graduates' critical thinking abilities and failure to analyse and cope with critical situations.⁸ Thus, nursing education needs to use appropriate teaching-learning approaches to overcome

this shortcoming.⁹ One of the modern educational approaches that can encourage critical thinking is concept mapping. A concept map is a two-dimensional schematic tool that presents a number of concepts in the framework of certain clauses. In fact, a concept map is a graphical presentation of the relationship between one concept and another and their relationship with other concepts surrounding a particular subject.¹⁰ The theoretical framework of concept mapping is based on Ausubel's theory of assimilation.¹¹ Meaningful learning occurs when the learner actively relates the new knowledge to his/her previous knowledge and, as a result, gains a better view of the new material and is better prepared to face it.^{11,12} Several studies have recommended concept mapping to teach critical thinking and evaluation,^{11,13} planning and recording care plans,¹⁴ and clinically educate nursing students.¹⁵ However, some of these studies did not have strong research designs.¹⁶ Recently, some quasi-experimental studies assessed the effect of conceptual mapping on knowledge and learning of students and the results showed positive outcomes, like increasing information about diseases, increasing information about treating diseases, improving drug information and promotion of clinical skills in nursing students.¹⁶⁻¹⁸ However, most of these studies evaluated the effect of concept mapping on meaningful learning in theoretical courses.^{10,11,14} But a study investigated the effect of conceptual map on critical thinking skills of

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nursing students in clinical setting, and showed that the method could not improve students' critical thinking skills.¹⁹ The conflict might be attributed to the small sample size or to the practical problems related to students' education in the clinical setting. Thus, more investigations are needed to examine the effect of conceptual mapping on the development of nursing students' critical thinking skills.

The current study was planned to determine the effect of conceptual mapping on critical thinking of nursing students who were passing their clinical rotation.

Subjects and Methods

The quasi-experimental case-control study was conducted from April 2015 to October 2016 at the University of Medical Sciences, Shiraz, Iran, and comprised students of Fatemeh-Zahra School of Nursing and Midwifery, Shiraz. The students were randomly assigned to intervention and control groups

The students in the 4th and 5th semesters were selected through convenience sampling. Those included had passed the medical surgical internship III and IV in nephrology, respiratory, and gastrointestinal (GI) wards, were willing to participate, and were unfamiliar with conceptual mapping. Students who were absent in their practical sessions, those not willing to participate or those who showed lack of interest after enrolment were excluded.

After approval was obtained from the institutional ethics committee, the sample size was calculated on the basis of literature²⁰ Informed consent was obtained from all the subjects.

The California Critical Thinking Skills (CCTS) Test Form B was used to evaluate the participants' critical thinking abilities. This questionnaire contains 34 multiple-choice questions, which evaluate critical thinking in high school graduates and above. This questionnaire assesses the critical thinking skills that are deemed as primary in education, and no specialised academic knowledge is required to answer the questions.¹⁵ It evaluates critical thinking in five areas; analysis, inference, evaluation, induction, and deduction. Scores 1 and 0 are allocated to true and false responses, respectively.²¹ Thus, an individual's total critical thinking score can vary between 0 and 34.^{17,21} In the present study, the Persian version of the questionnaire was used whose reliability and validity have been approved already.^{21,22} Before the intervention, both groups were invited to the nursing school and they completed the demographic (age, gender, marital status, Grade Point Average [GPA], and accommodation)

proforma and the CCTS questionnaires. Students in each group were then randomly divided into 5 teams of 9 students. Both groups participated in 24 six-hour training sessions held 3 days a week. The intervention group was educated based on conceptual mapping. All the concepts taught in this educational method were in the form of images and intertwined shapes (spider-like). The main concept was located in the centre, and minor ones were on the sidelines. The group spent the first session on learning about definition of conceptual map, how to implement this method, and the benefits of conceptual mapping. During 23 sessions, 11 educational topics (Chronic Obstructive Pulmonary Disease [COPD], asthma, acute respiratory distress syndrome [ARDS], atelectasis, pulmonary embolism, pneumothorax, renal failure, glomerulonephritis, pyelonephritis, liver failure, and liver cirrhosis) were selected according to the lesson plans of medical surgical nursing III and IV courses and common diseases in the aforementioned clinical settings. Each topic was taught over two sessions. During the first session, the students presented a conceptual map considering the potential and practical problems related to the patients they were responsible for. Then, defects and problems of the provided conceptual map were identified by other students and the instructor, and some recommendations were provided. During the second session, each student represented his/her revised conceptual map.

The students in the control group were also divided into 5 teams of 9 and first received some descriptions on the purpose of the programme, students' duties, and the integrated educational method. Similar to the intervention group, the students received 24 six-hour educational sessions on the same 11 topics using integrated method (i.e. group discussion, conference, and lecture). Each topic was taught through two sessions. During the first session, the topic was presented through lectures and then the students' questions or difficulties in understanding were resolved. In the second session, the students were asked to provide nursing diagnoses and care plans for patients on the basis of the content taught in the previous session. Two weeks after the intervention, all the students completed the CCTS questionnaire once more.

Data was analysed using SPSS 13 and was expressed as means and standard deviations (SDs). After the normal distribution of the data was established, independent samples t-test was used to compare the two groups' mean scores of critical thinking. In addition, paired t-test was used to compare the means of changes in the two groups' critical thinking scores before and after the intervention.

$P < 0.05$ was considered statistically significant.

Results

Of the 105 students initially approached, 24(23%) were excluded and the final sample stood at 81(77%). Of them, 41(50.6%) were in the intervention group and 40(49.4%) in the control group. The mean age was 25.12 ± 3.71 years in the intervention group and 25.5 ± 4.10 years in the control group. There was no significant difference between the groups in terms of age, gender, marital status, GPA, and place of living ($p > 0.05$) (Table-1).

At baseline, there was no significant difference between the mean critical thinking scores of the two groups ($p = 0.781$). Post-intervention values increased in both groups, but the mean critical score was significantly higher in the intervention group ($p < 0.0001$) (Table-2).

Considering the areas of critical thinking, no significant differences were observed between the mean scores of

Table-1: Socio-demographic information of the participants in the intervention and control groups.^a

Socio-demographic variables	Intervention group	Control group	P-value
Sex			0.228 ^b
Female	32 (78.0)	33 (82.5)	
Male	9 (21.9)	7 (17.5)	
Marital status			0.552 ^b
Single	36 (87.8)	34 (85)	
Married	5 (12.2)	6 (15)	
Living place			0.173 ^b
Shiraz	29 (70.7)	32 (80)	
Out of Shiraz	12 (29.2)	8 (20)	
Mean Age (years)	25.12 ± 3.71	25.5 ± 4.10	0.586 ^c
Mean Grade point average	16.92 ± 1.01	16.85 ± 0.82	0.183 ^c

^aData are presented as n (%) or Mean \pm standard deviation (SD).

^bChi-square statistics^a

^cIndependent t-test.

Table-2: Comparison of the intervention and control groups regarding critical thinking.^a

Critical thinking	Pre-test M \pm SD	Post-test M \pm SD	Mean change X \pm SD	Confidence interval	t ^b	P-value
Intervention	15.22 ± 3.72	22.51 ± 3.84	-7.28 ± 5.92	9.86, -4.58	-3.94	<0.000
Control	15.00 ± 5.20	18.17 ± 2.03	-3.17 ± 4.19	-5.24, -1.05	-2.38	<0.000
t ^c	-1.26	-2.35	2.49			
P-value	0.781	<0.000	<0.000			
Confidence interval	0.24; 0.81	2.00; 12.72				

^aData are presented as Mean \pm standard deviation (SD)

^bPaired t-test

^cIndependent t-test.

Table-3: Comparison of the areas of critical thinking in the intervention and control groups.

Areas	Pretest	Posttest	Mean change	P-value ^b
Evaluation				
Intervention group	2.11 ± 0.93	3.65 ± 0.93	1.82 ± 1.36	<0.0001
Control group	1.94 ± 1.03	3.77 ± 0.77	1.54 ± 1.22	<0.0001
P-value ^a	0.12	<0.0001*		
Analysis				
Intervention group	2.20 ± 1.13	3.62 ± 1.16	1.42 ± 1.57	<0.0001
Control group	1.42 ± 0.94	1.77 ± 0.42	0.34 ± 0.83	<0.02
P-value ^a	0.92	<0.0001*		
Deductive				
Intervention group	2.77 ± 1.22	5.48 ± 1.37	1.42 ± 1.57	<0.0001
Control group	2.51 ± 0.31	2.38 ± 0.51	0.20 ± 1.36	0.4
P-value ^a	0.97	<0.0001*		

^aIndependent sample t-test

^bPaired t-test.

different areas of critical thinking in the two groups. However, post-intervention mean scores of the two groups were significantly different ($p < 0.05$) except in the inductive and inference areas ($p > 0.05$). A significant difference was found in the intervention group's deduction and the control group's induction scores (Table-3).

Discussion

Results showed that concept mapping enhanced the students' critical thinking skills. The results also showed that both concept mapping and the routine integrated approaches improved the nursing students' critical thinking skills, but the concept map group showed greater improvement. The positive impact of concept mapping on critical thinking skills has been verified by other studies, too.^{3,13,23} A study concluded that concept mapping improves nursing students' motivation and knowledge level.²⁴ Another study showed that teaching through conceptual mapping could improve nursing

students' clinical skills compared to traditional methods.²⁰

Concept mapping creates a network of relationships among concepts and necessitates reflection on the elements constituting every concept. Since students try to find relationships between concepts in concept map, they get a chance to practise and improve their critical thinking skills. As individuals design different parts of a reasoning map, they get to improve their critical thinking skills.²⁵ However, the results of two studies comparing the impacts of clinical concept mapping and nursing process on nursing students' critical thinking skills showed no significant difference between the two groups.^{19,26} These results were attributed to the students' greater familiarity with the nursing process compared to concept mapping.¹⁹

In the present study, the nursing students in the control group also ended up with improved critical thinking skills. This was in accordance with the findings of another study, which confirmed the positive influence of routine education (group discussions, lecturing, and questioning) on critical thinking skills.¹¹ In the current study, the routine approach consisted of group discussions, conferencing, and clinical rounds. In this approach, information is communicated between the instructor and the learners. In this way, the instructor uses words and concepts to form the learners' cognitive structures and the learners take part in group discussions.

In our study, the students in the group educated by concept mapping showed more improvement in their critical thinking skills compared to the control group. This finding was similar to the results of other studies, indicating the greater effectiveness of concept mapping compared to other educational approaches in enhancing nursing students' critical thinking skills.^{11,27} The reason for this difference seems to lie in the nature of concept mapping. To design a concept map, a learner needs to acquire sufficient information about the topic in question. Then, by using the data, students can make a conceptual map by drawing a pyramid in which general contents lead to a more specialised content.¹⁷ On the other hand, drawing conceptual map helps learners to put the gained data into a more familiar framework.^{16,17} Thereby, the learned concept remains in the long-term memory and helps strengthen meaningful learning.²⁸ These two factors help learners classify the new information, which in turn increases the possibility of finding a relationship between the new and old concepts, eventually resulting in greater understanding and better learning.¹¹

The findings of the present study revealed significant differences between the two groups' critical thinking

scores in the areas of evaluation, analysis and deduction. Here, evaluation means validating information and evaluating the relationships within that information. In addition, inference refers to the ability to make conclusions. Analysis is also defined as understanding the objective of and the relationships among the materials.²⁹ Induction means extracting results based on logical reasons. Finally, deduction refers to making conclusions based on general principles. Other studies, too, have reported such differences in the areas of critical thinking.^{10,30} These differences can be due to different educational approaches and the characteristics of the subjects under study. In this method, students collect the content from different sources, evaluate the credibility of data and relationships between the concepts, and then show the relationship between the concepts by drawing a pyramid of general to specific contents.¹⁷ By this method, students have more time to deal with the concept; therefore, the concept is transferred to their long-term memory which in turn enhances meaningful learning, analytical power, and deductive reasoning. However, some studies have come to contradictory results about critical thinking.^{10,11,18} These contradictions could be due to different educational methods or different characteristics of the study participants.

One of the limitations of the current study was the short duration of the intervention. Thus, further studies with longer intervention periods are recommended on the issue. Also, future studies are recommended to compare concept mapping to other active teaching methods. Additionally, because the participants were only selected from one college and the sample size was rather small, the results cannot be generalised. Hence, multi-centre studies with larger sample sizes are recommended.

Yet, the results provide an evidence-based perspective for nursing instructors and teachers to use conceptual map as an active, effective, and low-cost method that can be taught easily in clinical settings as well as in continuing educational programmes.

Conclusion

Concept mapping led to a greater improvement in the nursing students' critical thinking skills compared to those exposed to the routine approach.

Disclaimer: None.

Conflicts of Interest: None.

Source of Funding: None.

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