

The Effect of Case-Based Learning with or without Conceptual Mapping Method on Critical Thinking and Academic Self-Efficacy of Nursing Students

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Abstract

Objectives: Learning is an essential challenge in nursing student's education. Beneficial learning has a major impact on upbringing efficient nurses. However, one of the methods for achieving optimal learning is using combined strategies for education. Thus, the aim of this study was to assess the effect of case-based learning with or without conceptual mapping on nursing student's critical thinking and academic self-efficacy. **Material and Methods:** The present semi-experimental study was conducted among 55 nursing students in their fourth semester of the curriculum (28 students in the experimental group and 27 students in the control group). Before beginning the education, critical thinking and academic self-efficacy of students in both groups were assessed by the California Critical Thinking Skills Test form B (CCTST) and College Academic Self-Efficacy Scale (CASES). The control and experimental groups were educated with concept mapping teaching method and without concept mapping teaching method, respectively, for a duration of 8 weeks (each session lasted for 45 minutes). Statistical analysis was accomplished by SPSS software, version 13. **Results:** There were no statistically significant differences between both groups in regards to demographic characteristics. In the control group, critical thinking significantly increased at the end of the trial in comparison to the beginning of the procedure ($p < 0.001$). However, there were no statistically significant differences between the two groups in regards to academic self-efficacy ($p = 0.06$). In the educational

group, both critical thinking and academic self-efficacy differed significantly when comparing the beginning and end of the intervention ($p = 0.001$). In this regards, both critical thinking and academic self-efficacy increased after the intervention. Comparing the average scores of post-test analysis of groups for critical thinking and academic self-efficacy were statistically insignificant. **Conclusions:** Using integrative education methods such as conceptual mapping in combination with case-based education had a significant effect on enhancing student's critical thinking and academic self-efficacy.

Keywords: Conceptual mapping; Case-based education; academic self-efficacy; Critical thinking.

Introduction

Learning is one of the major issues in nurse's education, which requires new strategies (Habibzadeh et al., 2013). Due to the improvements of scientific researches and using new diagnosing and therapeutic methods, and also a high demand for methods that are able to manage the abundant amount of information, there is a need for changes in the educational system. Beneficial education requires integrative teaching methods in which the educator has an active role instead of traditional teacher-based teaching (Mirzaei and Zahmatkesh, 2013).

One of the important actions of educational planning is choosing an optimal educational method (Amanat, Danaei and Amanat, 2010) because efficient learning is the result of an appropriate educating (Baghaie, 2002). According to the standards of the Federation of Medical Education in 2003, universities must involve students with education by choosing appropriate educating methods. Any change in the educational system that is not along with changes in the quality of educating methods, is not thoroughly successful. In recent years, a few important actions have developed and modulated differently educating. According to studies, in comparison to traditional methods, modulating education in all fields of the educational system results in achieving higher scores

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(Nowroozi et al., 2011; Rahmani et al., 2007; Zohari, Nikravan, 2008).

Deubel believes that using only one educational theory and teaching pattern is not sufficient for developing active learning in learners, thus the modulation of educational spectrums and teaching patterns is beneficial (Deubel, 2003). In Abate's study, it was indicated that achieving an efficient education is feasible when a combination of databases and educating methods are used (Abbatt, 1992). Additionally, in Elisabeth's study which was accomplished with the objective of assessing techniques and strategies used by nursing educators, it was indicated that student's knowledge and clinical skills increase efficiently in the classes in which the educators use combinational strategies and methods in the clinical education (Elisabeth, Christine and Ewe, 2009). In another study accomplished by Bahadorani and colleagues with the objective of comparing the effectiveness of online, personal and modulating educating methods, 40 medical students were educated by the mentioned educating methods. The student's knowledge, skills, and satisfaction were assessed and compared. According to results, the score of student's knowledge and skills was higher in the modulating educating method in comparison to the two other groups (Bahadorani and Changiz, 2006).

The integrative teaching method is able to increase student's enthusiasm in class for two reasons: first, the teacher is not the only one who speaks in the class; in fact, all of the students participate, thus; the class is not a steady environment. Secondly, if a student previously studied the subject, he/she will be conscious in the class. In addition, if a subject is not understood, the student will be willing to find the answer. Thus, this method of education increases student's eager and desire to participate in the class (Nowroozi et al., 2011).

The integrative teaching method, used in this study consists of case-based learning and conceptual mapping methods. One of the integrative teaching methods is case-based learning. This type of education enhances active learning among students (Ghafourifard et al., 2013). This method was first introduced by Harvard University and has been recently accepted as an efficient method for learning, decision making and problem-solving by different university fields including nursing (Kaddoura, 2011). In case-based learning, the teacher and the student actively participate in the class discussions. Moreover, it helps the learners in analyzing materials to discover their problems and find appropriate solutions. In addition, using this method creates an opportunity for students to be familiar with nursing challenges in the real world and in a secure situation (Chen and Lin, 2003). In case-based learning, a case scenario is introduced in a real situation and requires actions such as decision making and problem-solving in a duration of 45-90 minutes. In each session, only one case is introduced and the optimum number of learners is 20-30 individuals. The teacher displays a scenario and the students listen precisely and take

notes. An opportunity is given to the students to think about a subject. Afterward, the teacher begins the discussion with a general question such as "what is the subject about" and asks the individuals to participate in the discussion. If required, the teacher provides additional information such as diagnosing tests, symptoms, etc. The teacher has an initiating, intermediating and facilitating role in the procedure of learning which leads students to the objectives of the session (Stjernquist and Svalenius, 2007). In a study by Ghafourifard et al, it was mentioned that the most important characteristic of case-based learning is increasing the student's conception regarding the type of lecturing. 66.7% of students claimed that case-based learning is better than traditional teaching methods such as lecture (Ghafourifard et al., 2013).

According to researches, the student's knowledge and enthusiasm increase by using active methods such as case-based learning and problem-solving (Hasheesh, Al-Mostafa and Obeidat, 2011). Researches in the Islamic Republic of Iran have indicated that 72% of nursing instructors use inactive methods such as lecture, which enhances student's individual method of education in the class and eventually leads to limited critical thinking (Taheri et al., 2008). Nevertheless, 92% of nursing students prefer new educational methods instead of traditional and inactive methods (Rahmani et al., 2007), because knowledge obtained by significant and active methods such as concept mapping stays in mind for a longer time and improves nursing student's critical thinking skills and ability to solve problems (Sarhangi et al., 2011).

Case-based learning is an efficient learning method, which improves critical thinking. It enhances problem-solving and clinical skills as well as learning (West, Usher and Delaney, 2012). In Yin's study, some disadvantages of case-based learning were mentioned: first, it has not been given too much credit to case-based learning and also "most case studies are uncontrollable and vague evidence or arrogant perspectives may affect the results of the study". Second, case studies cannot be scientifically generalized, since studies are limited and most of them are accomplished on only one topic. Third, collecting data for case studies is difficult and time-consuming (Yin et al., 2014). Additionally, the type of research is not well understood in this education system.

Another method of education which is used in combination with other educational methods is Conceptual Mapping. Govin & Novak introduced conceptual mapping as one of the latest teaching approaches for organizing and developing knowledge which is based on Azoubel's unifying learning theory (Sadeghi-Gandomani, Delaram and Naseri-Brugeni, 2014). According to this student-based method, students learn materials by emphasizing on previous lessons and adjoin each concept with other concepts by connecting words (Mirzaei et al., 2013). Educational theorists believe that using educational methods for improving significant learning such as conceptual

mapping, enhances learning, critical thinking skills and creative thinking among learners (Rahmani et al., 2007).

Different studies have been accomplished with the aim of assessing the effect of conceptual mapping on nursing student's critical thinking skills, learning and summarizing abilities. According to the results, these factors have a positive effect on conceptual mapping. One of the disadvantages of conceptual mapping is being time-consuming. However many people believe that conceptual mapping is administered over time along with a rapid and easy practice (Hill, 2004; Yekta and Nasrabadi, 2004; Wheeler and Collins, 2003; Chang, Sung and Chen, 2002). Another study was accomplished by Hsu with the aim of developing conceptual mapping based on a problem-oriented scenario for nursing students. Results indicated that despite positive effects, there were not any significant differences between the groups (Hsu, 2004).

Due to the significant evolutions of health treatment in the last years and different changes such as technology expansion and referrals increasing demands for a high quality treatment, decreasing costs, and declining duration of hospitalization; nurses face complicated issues and problems in the field of health care treatments day by day, which requires critical thinking abilities in order to make precise decisions (Simpson and Courtney, 2002). This is mainly because critical thinking increases nurses' clinical decision making capability in order to diagnose the patient's demands and choose the best nursing methods (Habibzadeh, Rasuli and Moradi, 2014). This fact has been considered as an important aspect for health personnel, midwives, and nurses' professional performance. Critical thinking is a cognitive process, which enables the individual to verdict and decide by assessing, analyzing and summarizing available data, (Sarhangi et al., 2011).

Current educating methods which are common in universities, up bring students with high theoretical information to the community. Nevertheless, they are unable to even solve small problems in the community. This is mainly because, in traditional educating methods, universities only provide a collection of data and concepts to students, but they are left alone when it comes to analyzing, prioritizing and organizing the emerging knowledge. These abilities require critical thinking skills and efficient and significant learning. Thus, for developing student's critical thinking abilities, it is essential to enhance logical and intelligent skills instead of just memorizing information (Khalili, 2004). Salivan and colleagues indicated that 20% of nursing curriculums are in accordance with critical thinking skills. Their results indicated that nurses potency for critical thinking and decision making are limited (King and Shell, 2002). Since traditional methods rely on linear thinking models, they cannot be used in the current complicated educational system. Whereas, conceptual mapping is a new meta-cognitive strategy in education (Ferrario, 2004). Researchers have mentioned the positive effect of conceptual mapping on critical thinking (Stjernquist and Svalenius, 2007; Sarhangi et al., 2011; Habibzadeh, Rasuli

and Moradi, 2014), but few studies have talked about using this kind of educational method in cognition with other methods and their effect on critical thinking (Rahmani et al., 2007; Amouzeshi, Mohsenizadeh and Amouzeshi, 2015).

One of the key factors, which enhances student's motivation and function despite self-regulatory effects, is self-efficacy. Self-efficacy is defined as the individuals' understanding regarding their capability to accomplish certain levels of function. Individuals with low self-efficacy get stressed while working, which affects their function and provokes them to withdraw or abandon work (Rezayat and Dehgannayeri, 2013). However, individuals with high self-efficacy, communicate with each other to overcome their problems (Hoseyni et al., 2015). Additionally, self-efficacy is related to an individual's health. Self-efficacy enhances self-esteem among nursing students by controlling stress and developing compatibility and results in a successful function (Rezayat and Dehgannayeri, 2013). Self-efficacy has a wide spectrum, such as social and educational self-efficacy. Educational self-efficacy is related to self-beliefs, leading to the success of educational duties (Schunk, 1991; Zimmerman, 1995; Bandura, 1991).

According to the researches, some educational self-efficacy results include improvement of self-enthusiasm, accomplishing goals, having less stress and eventually educational improvement. In 2003, Bong and Skaalvik concluded that academic self-efficacy has a significant effect on enthusiasm, perception, and success (Bong and Skaalvik, 2003). Based on the results of various researches, conceptual mapping enhances student's self-efficacy (Chularut and DeBacker, 2004; Rezaei et al., 2012). Another study by Ledger in 2003 reported that students' self-efficacy is mildly reduced in the integrative conceptual mapping method (Ledger, 2003). Thus, due to the contradictory results, comprehensive and well-designed researches in this field are required.

Due to limited studies related to integrative methods, contradictory results, and the significant effect of conceptual mapping on nursing students' critical thinking and self-efficiency, it is essential to study on the conceptual mapping as a new educational method. Thus, we aimed to accomplish a study with the objective of assessing the effect of conceptual mapping along with case-based learning on student's critical thinking and self-efficacy.

Material and Methods

The present semi-experimental, pre-test and post-test designed study assessed the effect of case-based learning with or without conceptual mapping on nursing student's critical thinking and educational self-efficacy. Participants were nursing students in their fourth semester of the curriculum (n=60) studying in one of the North West universities of Iran and were studying "disorders of adults and elderlies" subject. Students were recruited according to the random number table, and after matching based on sex, age, and educational average, they

were allocated into experimental and control groups. Three of the students of the experimental group and two of the students of the control group were withdrawn of the study due to absence at class for more than three sessions. Thus, the study was continued with 55 students (28 students in the experimental group and 27 students in the control group). According to variance analysis, there were not any statistically significant differences in regards to age, sex, and the average before the baseline and students were not familiar with concepts such as critical thinking and academic self-efficacy. Before the commencement of the education, critical thinking and academic self-efficacy of the students of both groups were registered and collected via California Critical Thinking Skills Test form B (CCTST) and College Academic Self-Efficacy Scale (CASES). Method of education for both groups was case-based learning with and without conceptual mapping, for a duration of eight weeks (each session lasted 45 minutes). In this regards, the subject of each session was explained according to the educational curriculum by the instructor for a duration of 25 minutes.

Afterward, the students of both groups were educated for 25 minutes via the case-based method, according to the Kaddoura method, which consisted of five phases: introducing important materials, asking different questions, proving a comfortable environment, asking individuals to participate in the discussion and conclusion of the subject (Kaddoura, 2011). The experimental group was educated with the same subject via the case-based method with conceptual mapping for 45 minutes. Afterward, the students planned a conceptual map according to the main concept. In the first level, the essential information regarding the main concept was collected. The most important factor was the student's ability to concentrate on the main problems. In this regards, the students were asked to pay attention to the main medical diagnoses and then consider other factors such as clinical findings, methods for diagnosing disease, nurse's diagnoses, etc. At the next level, the data were categorized and analyzed. In this level, the students were able to understand the relationship between subjects. In the third level, the students were able to connect concepts with each other. They used different colors and dotted lines for determining connections between concepts (Montazeri et al., 2007). For example, the student determined the concept of an issue by directing the arrow from the concept of the disease to the symptom. The concepts, proposed by the students were assessed and appropriate feedbacks were provided.

After the education, student's critical thinking and educational self-efficacy skills were registered and collected via CCTST and CASES. Afterward, the data were analyzed by the SPSS version 13 software. The first section of the questionnaire consisted of demographic information such as age, sex, and educational average. The second section was about the specific questions regarding critical thinking skills which consisted of 34 multiple choice questions, with one correct answer. The questions were grouped in five areas: Inductive reasoning (14

questions), Deductive reasoning (14 questions), Analysis (5 questions), Evaluation (14 questions) and Inference (14 questions). Few of the questions were common in more than one area. The content validity of the questionnaire was evaluated by a national specialist in critical thinking and an ideal observer. The scientific reliability of the questionnaire was calculated as 0.68-0.7 by the Kuder –Richardson 20 formula (Khalili, 2004). The validity of the questionnaire was assessed by 10 academic members of the faculty. The score was from 0-34 and the students were asked to respond to the questionnaire for 45 minutes.

In this study, the CASES questionnaire (consisting of 33 items) was used for assessing students' self-efficacy, which was first designed by Owen & Froman in 1988. The present questionnaire assessed the students' reliance regarding taking notes, asking questions, paying attention in class, using computer and library, and other facilities (Miles, 2003).

Shokri and colleagues previously administered the self-efficacy questionnaire on 320 students in order to assess the psychometric properties of the questionnaire. The internal consistency of the questionnaire was 0.91, 0.90 for men and 0.91 for women, which indicated sufficient internal consistency. The reliability of the questionnaire was assessed and confirmed by Exploratory Function Analysis and Confirmatory Factor Analysis (Jamali, Noroozi and Tahmasebi, 2013). The validity was assessed by 10 academic members of the faculty. The reliability was assessed after performing it on 20-30 nursing students with a 0.85 alpha Cronbach.

For ethical consideration, the written informed consent was completed by all of the participants; the instructor and the researcher participated in all the sessions of the study, and the compensatory classes were held for the control group at the end of the study in order to familiarize them with conceptual mapping.

Before beginning the study, the students of the intervention group were familiarized with conceptual mapping and its constructive methods for 45 minutes.

Results

The results of the study were analyzed by the SPSS software version 13 with a 95% confidence interval. A total of 55 nursing students participated in the study, 28 students in the experimental group and 27 students in the control group.

The normality of data was assessed by the Kolmogorov–Smirnov test and since the data were normally distributed, we used the independent t-Test. According to the independent t-Test, there were no statistically significant differences in respect to variables including sex, age, and the average between the two groups.

Table 1: Comparison of gender characteristics of the study groups

	Sex		Total
	Men	Women	
Experimental group	13 (48.1%)	14 (51.9%)	27 (100%)
Control group	14 (50%)	14 (50%)	28 (100%)
Total	27 (49.1%)	28 (50.9%)	55 (100%)

Table 2: Comparison of critical thinking and educational self-efficacy mean score of both groups before and after commencing the case-based education with and without conceptual mapping

Group	Experimental group (case-based education with conceptual mapping) n=28						Control group (case-based education) n=27					
	Pre-test	Post-test	average	T	Df	P*	Pre-test	Post-test	average	t	Df	P*
Critical thinking	11.4	15.75	4.36	-9.07	27	*<0.001	11.15	14.33	2.59	-4.93	26	**<0.001
Educational self-efficacy	104.5	112.57	8.07	-5.81	27	*<0.001	110.22	112.81	3.18	-0.9	26	***0.06

*P-value less than 0.05 considered as statistically significant.

**Paired T-test

***Wilcoxon

According to Table 2, based on paired t-test, there were significant differences before and after critical thinking in the control group ($p < 0.001$). However, there were no statistically significant differences in educational self-efficacy before and after the intervention ($p = 0.06$).

Significant differences were observed for critical thinking and educational self-efficacy before and after the intervention in the control group ($p = 0.001$). Both academic self-efficacy and critical thinking increased after the intervention. Although there were no statistically significant differences between the two groups before the intervention in regards to academic self-efficacy and critical thinking, we used the covariance analysis to adjust variables at the intervention, which resulted in no statistically significant differences (table 2).

Additionally, significant differences were observed after assessing the effect of time (before and after) and group (experimental and control) by duplicate measurement analysis ($p = 0.001$). However, the integrative effect of time and group was not statistically significant ($p = 0.009$). However, the effect of time on self-efficacy was significant ($p < 0.001$) (table 2).

Discussion

Nowadays teachers are seeking for teaching methods that lead to active learning (Russell, Comello and Wright, 2007). Case-based education is a student-oriented teaching method, which begins with introducing a case by the teacher (Kaddoura, 2011).

The objective of this study was to assess the effect of case-based learning with or without a conceptual map on critical thinking and educational self-efficacy of nursing students. Findings indicated that there were no statistically significant differences between the two groups regarding factors such as age, sex, and the average that may affect the results of the study. In other words, both groups were homogenous.

The results of comparing the average scores of pre and post-test analysis for critical thinking in the control group was statistically significant ($p < 0.001$) (table 2). These findings revealed that case-based education has a positive effect on the student's critical thinking. Similar findings were observed in West et al's study. In this study, the effect of case studies before commencing education was assessed on 226 nursing students. For a duration of 10 weeks, subjects such as practical and theoretical issues of anatomy and physiology were educated. According to the results, case-based learning is an efficient teaching method, which improves critical thinking skills and emphasizes problem-solving and clinical skills, and eventually enhances students learning abilities (West, Usher and Delaney, 2012). Additionally, there were no statistically significant differences between the mean score of pre and post-test analysis for self-efficacy in the control group ($p = 0.06$) (table 2). This finding indicated that case-based learning independently might not have an effect on students' self-efficacy.

In the experimental group, the mean differences between pre and post-test analysis for critical thinking and self-efficacy were statistically significant ($p < 0.001$) (table 2). According to the results, the students' critical thinking and self-efficacy skills increased after the intervention.

In addition, insignificant differences were observed between two groups in critical thinking ($p=0.09$) and self-efficacy ($p=0.13$).

The results of the present study were in accordance with the results of Kunselman's study (Kunselman and Johnson, 2004) as well as with Russell et al's study, which mentioned enhanced learning via case-based learning and critical thinking (Russell, Comello and Wright, 2007).

In 2012, Lee et al. accomplished a study with the objective of assessing the linear effect of conceptual mapping education on nursing students' critical thinking. In this linear semi-experimental study, 95 nursing students were recruited in their second year of education. The students were divided into experimental and control groups. The results showed that conceptual mapping had a positive effect on critical thinking which was similar to the findings of our study (Lee et al., 2013). Another semi-experimental study was accomplished by Chen in 2010 with the objective of assessing the effect of conceptual mapping on critical thinking and education on 95 students in their second semester of education. The students of the control group and experimental group were educated for 15 minutes with lecture and conceptual mapping, respectively. In the experimental group, the conceptual mapping was used for education in addition to the scenario and lecture. The results showed that conceptual mapping had a significant effect on critical thinking and student's active learning (Chen et al., 2011). In 2012, Rezaei et al. performed a study in order to assess the effect of conceptual mapping and nursing students' self-efficiency, self-regulation, and cognitive strategies. This study was a semi-experimental study on 53 nursing students who were divided into experimental and control groups. These two groups were educated via the conceptual mapping method and nursing procedure, respectively. The results indicated that conceptual mapping had a positive effect on enhancing the nursing students' self-efficacy. Nevertheless, no significant differences were observed for students that were educated via nursing procedure (Rezaei et al., 2012). In another study by Ledger in 2003, the effect of conceptual mapping was assessed on students' self-efficiency. This study was accomplished for 12 months in pre and post-test procedures and resulted in a slight decrease in students' self-efficiency (Ledger, 2003).

Conclusion

Based on the findings of our study, case-based education, similar to integrative methods is able to enhance critical thinking skills. However, when comparing two methods, it can be seen that integrative educational methods are superior to case-based education in improving critical thinking self-efficiency skills. Other comprehensive studies with longer duration and combined with other templates are crucial to assess the effect of integrative educational methods on other courses of nursing and other fields of medical sciences. Moreover, assessing the strengths and weaknesses of these methods is essential.

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