

The effect of network-based education on critical thinking skills of nursing students

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Abstract

Introduction and aim: Critical thinking is a style of thinking that requires new and student-oriented education. Nursing mentors should try to train students interested in continuous learning according to the current conditions of clinical settings. This study was conducted with the aim of determining the effect of network-based learning on the critical thinking skills of nursing students studying at the Islamic Azad University of Golestan province in 2022.

Method: This is an experimental pre/post-test study with two intervention and control groups, which was conducted on undergraduate nursing students studying at Islamic Azad University of Golestan in 2022. Convenience sampling method was used in this study to collect the sample. A total of 50 students participated in this study, who were divided into two intervention and control groups by simple random allocation method found on the website. Data collection tools in this study included the demographic information form and the critical thinking disposition inventory (CTDI).

Findings: Before the intervention, the mean score of critical thinking was 343.76 ± 12.73 in the intervention group and 343.76 ± 12.73 in the control group, which showed no statistically significant difference ($P=0.2$). After the intervention, the mean score of critical thinking was 373.28 ± 18.55 in the intervention group and 340.2 ± 10.38 in the control group, which showed no statistically significant difference between the two groups ($P<0.001$).

Conclusion: The findings of this study showed that problem solving training through virtual means can be effective in improving the critical thinking of nursing students. Perhaps the use of this method can have a significant effect on education of students and consequently, improve the quality of nursing care.

Keywords: network-based, critical thinking skills, nursing students.

INTRODUCTION

Critical thinking is one of the effective factors in academic progress. It is also an essential component in clinical decision-making, nursing practice and education (1). In the thirty-eighth general conference of United Nations' Educational, Scientific and Cultural Organization (UNESCO) held in Paris from 3 to 18 November 2015 (recommendation on the education and training of adults) emphasis was on one of its objectives, which was the need to develop people's ability to think critically and act with autonomy and a sense of responsibility (2). In the medical science education, including nursing, the goal is educate people who can make the best decisions by integrating information and using excellent thinking skills (critical thinking), correct clinical reasoning and relying on evidence (3). Critical thinking is a useful skill in nursing profession (4).

Critical thinking and self-confidence are essential for success in clinical practice. Nursing educators should try to use educational strategies that help students to strengthen their critical thinking and self-confidence in complex situations. Therefore, Most of the nursing educators design educational programs with clear goals to improve students' critical thinking and self-confidence, more opportunities for students to improve their skills (5). Today, educational experts emphasize on new and comprehensive methods in education to create active learning in students. Also, due develop information and communication technology, encouraging innovative and interactive learning is suggested as an alternative to traditional approaches (6).

Methods such as virtual education or web-based learning are also provide the possibility of learning at any time among interactive methods, opportunity and place without any restrictions. In this environment, tutors by taking evaluation such as Q&A, encouraging students to think, and conducting research and projects can create an active/interactive learning environment (6, 7) and change students from passive to active learners. They can also improve students' critical thinking skills that they need to transfer or use their learned knowledge and skills in clinical setting (8). Another advantage of virtual education is that, students in this method can better communicate with clinical instructor through digital platforms (9). Electronic learning is related to Internet-based technologies in order to increase learning and improve critical thinking, self-centeredness and group working (10), and also by using online tools, it strengthens group critical thinking, research-centered learning and group problem solving. Use of virtual social networks in education creates multiple social interactions that foster cognitive and social skills, and increases interpersonal intelligence through critical thinking to build personal responsibility and independence. It also helps learners to manage tools, applications and information sources, and assume different roles in the network, which helps them to foster tolerance towards differences. It also increases self-esteem and self-confidence of learners and makes it possible for them to communicate with teachers from distance (11).

Many researchers have studied electronic education. For instance, Almaghaslah's study on pharmacy students in Saudi Arabia showed that e-learning was effective in students' learning so that, it made a significant difference in all six levels of Bloom's classification (12). The power of social networks is not due to their ability to produce and share knowledge; it is rather in their ability to provide the possibility of reflection and production of new knowledge. The use of social networks and virtual space in both teaching and learning processes has been accepted from the viewpoint of teachers and students. Web-based enriched learning, in spite of perceived barriers and challenges, can be a suitable platform for facilitation, acceleration and creativity in the educational process (13).

Therefore, the teaching style of nursing managers and educators will play an important role on attitude and learning of students (9, 14). Since virtual social networks are entering the field of education and research at an increasing speed (13, 15) and despite their positive advantages, they also have disadvantages such as; isolation and lack of face-to-face social interaction, lack of discourse skills development among learners, demand for strong motivation and time management skills, lack of verbal and non-verbal cues, and the possibility of cheating such as participation of other people in exams and tests instead of learners. These problems along with the lack of students' interest in learning have caused the electronic education not to have the necessary efficiency in achieving desirable and high-quality goals. Since education plays an important role in improving skills, learning and creativity (17-19), researchers in this study decided to conduct a study with the aim of determining the effect of scenario-based virtual education on the critical thinking skills of nursing students.

METHOD

This is an experimental pre-test/post-test study with two intervention and control groups, which was conducted on undergraduate nursing students studying at Islamic Azad University of Golestan province, Iran. This study was carried out on students at the 7th and 8th semester after receiving the code of ethics (IR.IAU.D.REC.1401.007) and permission from Islamic Azad University of Golestan in 2022.

The criteria for entering the study included; having no history of scenario-based education, being at the age range of 18-25 years, and having no probation and failed module. Students with more than three absences, visiting students in other provinces, and students who were unwilling to continue with the study were excluded from the study.

In order to determine the sample size, the primary information to calculate the effect size for critical thinking score through intervention was obtained from a similar study conducted in 2017 by Azarmi. Therefore, according to the mean score of 9.42 (standard deviation of 3.74) for the control group and 12.43 (standard deviation of 2.58) for the intervention group, which was obtained from a similar study, and considering 95% confidence level and 80% test power using Pocock formula, the minimum sample size in each group was estimated to be 18 people. However, taking into account the possibility of 30% sample drop, 25 people were considered for each group.

The non-probability convenience method was used to collect sample among nursing students studying at Azad University of Gorgan (Bandargaz, Aliabad, Gorgan and Gonbad units). At first, 50 students who met the inclusion criteria were selected from 190 students, and then they were allocated into two intervention group (I) and control group (C), using random allocation method available on <https://www.graphpad.com/quickcalcs/randomize1/>. Initially, the prearranged random allocation on the website was written in sealed envelopes and given to each student by the research assistant. After explaining the study objectives, the non-compulsory nature of participation in the study, the random allocation in any group, and the freedom to withdraw from the study at any time to students, a written informed consent was obtained from them. Topics were selected from courses that students were familiar with. The demographic information form and the critical thinking disposition inventory (CTDI) were completed by the students. The CTDI contains 75 questions that measure the seven components of tendency towards critical thinking, including truth-seeking with 12 questions, receptivity to criticism with 12 questions, ability to analysis with 11 questions, being systematic and ability to organize information with 11 questions, curiosity with 10 questions, self-confidence with 9 questions, and growth with 10 questions. The validity of this questionnaire was evaluated by 10 professors of Islamic Azad University. The reliability of this tool has been reported by Azarmi (2017) with Cronbach's

alpha of 85% (16). The scores obtained from this questionnaire vary from 75 to 450, with higher score indicating higher critical thinking.

In the first session, the network-based teaching method and how to use it were explained to each group separately in a 90-minute session.

During eight training sessions 90-minute, scenarios were presented to students in each session separately. In the problem solving group, the researcher's assistance in each session talked about factors that can engage students with the subject, and the students discussed it with each other virtually in WhatsApp groups of 5-6 people. Then, the design of a comprehensive nursing process up to the planning phase was done based on NANDA for the scenario proposed by the students. The selected scenarios were designed and selected by the nursing professors from the patients hospitalized in the ward (Table 1).

Session	Scenario
1	Introduction of research objectives - familiarization and review of NANDA nursing process – taking pre-test
2	The patient, an 80-year-old man with a history of chronic hypertension, was admitted to the neurosurgery department with a transient stroke two days ago. His wife had died 8 years ago and he was living alone. The patient has been having hearing impairment for the last two years. In the examination, we found that the patient does not follow his medication regimen. Outline nursing diagnoses and interventions.
3	A 4-year-old child with nephrotic syndrome was recently diagnosed. His mother is housewife and his father died of kidney failure last year. The mother has difficulty diagnosing her child's illness and denies it. The mother insists on changing her child's doctor. According to the child's condition, please write nursing diagnoses related to the family.
4	The patient is a woman with breast cancer undergoing chemotherapy. Due to the side effects of chemotherapy, the patient has nausea and anorexia. She also mentions symptoms of white spots in the mouth since the previous day. According to the mentioned items, please write nursing diagnoses and expected goals and results.
5	The patient is an 80-year-old man with a urinary infection. His 69-year-old wife with high blood pressure and hearing loss due to old age is taking care of him. His wife admits that her husband suffered from urinary incontinence last week, and despite taking the doctor's medicine, there was no improvement in his condition. Other differential diagnoses such as diabetes and disorders unrelated to the prostate have also been ruled out. According to the mentioned items, what other items do you consider in the review and also write the nursing process up to the planning stage.
6	Andrea is a 39-year-old woman who has had cancer for five years. She underwent chemotherapy and radiotherapy that had many side effects. The latest tests showed that the cancer had spread throughout her body. More radiotherapy and chemotherapy have been recommended for her. She has also been offered a bone marrow transplant. Andrea is now facing treatments with very poor survival rates. Afraid of becoming incapacitated and losing control if the cancer spreads to her brain. She asks her nurse, Dr. Stanley, to help her die with a lethal dose of medicine when the cancer reaches her brain. Write your nursing process for her.
7	An 8-year-old patient with ITP with 19,500 platelets has come to the hospital with one of the school officials due to severe bleeding and requiring platelets urgently. The child is extremely restless and does not cooperate with the nurses due to the absence of his parents. A history of thrombocytopenia and previous bleeding was not reported to the school authorities by the parents. The child's blood group is unknown. Fixing an IV access is difficult for the child due to his extreme restlessness. According to the ethical challenges of decision-making for children, adjust the appropriate nursing process for the child.
8	Solving problem - taking post-test

In order to prevent the exchange of information between students in the intervention and control groups, the students in the intervention group were asked not to share their information with the students in other groups. The results obtained were analyzed by SPSS-16 software, using descriptive and inferential statistics.

FINDINGS

The mean age of students was 22.16 ± 1.8 years in the control group and 21.68 ± 0.85 years in the intervention group. Independent t-test showed no significant difference between the two groups in terms of age ($P=0.25$). Chi-square test showed no significant difference between the two groups in terms of gender ($P=0.38$). Also, the independent t-test did not show a significant difference between the two groups in terms of GPA ($P=0.97$).

Independent t-test before the intervention did not show any significant difference between the intervention and control groups in terms of the mean scores of overall critical thinking and any of the critical thinking dimensions (Table 1).

Independent t-test after the intervention showed a significant difference between the two groups ($P < 0.01$) in terms of the mean scores of overall critical thinking and any of the critical thinking dimensions. However, this difference was not observed in the dimensions of growth and self-confidence, but it was observed in other dimensions of critical thinking (Table 1).

Paired t-test in the control group before and after the intervention did not show any significant difference in any of the critical thinking dimensions, but after the intervention it showed a significant difference in some of the critical thinking dimensions in the intervention group.

The ANOVA test showed a significant difference ($P < 0.01$, $\eta = 0.62$) by removing the pre-test effect. So it can be said that 62% of post-test changes are caused by the online training (Table 2).

Table 1: Comparing the mean and standard deviation of critical thinking score between the intervention and control groups before and after the intervention receptivity to criticism with 12 questions, ability to analysis with 11 questions, being systematic and ability to organize information with 11 questions, curiosity with 10 questions, self-confidence with 9 questions, and growth with 10 questions

Table 1: Comparing the mean and standard deviation of critical thinking score between the intervention and control groups before and after the intervention

Group Dimension of CT	Before the intervention			After the intervention		
	Intervention	Control	P-value	Intervention	Control	P-value
Truth-seeking	53/2 ± 3/17	51/4 ± 3/36	P=0/2	56/84 ± 4/2	51/52± 4/26	P< 0/01
Receptivity to criticism	53/84 ± 3/69	52/35 ± 2/79	P=0/11	65 ± 4/12	52/04± 4/9	P< 0/01
Analysis	50/28 ± 3/83	49/76 ± 6/12	P=0/72	54/12± 3/85	46/58 ± 2/69	P< 0/01
Organize information	50/08 ± 3/1	50/4 ± 6/09	P=0/77	52/22± 5/41	49/21± 2/75	P< 0/01
Curiosity	50/2 ± 3/94	50/49 ± 3/6	P=0/56	51/84 ± 3/72	49/21 ± 2/75	P=0/01
Self-confidence	38/76 ± 2/96	37 ± 3/16	P=0/06	43/12± 3/05	49/28 ± 3/57	P=0/06
Growth	47/4 ± 2/36	47/36 ± 2/76	P=0/95	50/2± 4/16	47/96 ± 4/01	P=0/06
Overall dimension	343/76 ± 12/73	± 10/72 338/48	P=0/2	373/28± 18/55	340/2±10/38	P< 0/01

Table 2: The effect of online education on the critical thinking of nursing students

Source of variance	Sum of squares	Degree of freedom	Mean of squares	F-value	Significant level	Eta
Modified model	18042.58	2	9021.29	65.4	P < 0.01	0.73
Post-test separator	4397.06	1	1577.54	11.23	P < 0.01	0.19
Group	10584.22	1	4397.06	76.13	P < 0.01	0.62
Error	6482/73	47	137/92			
Sum	638410	50				
Total	24525.12	49				

DISCUSSION

The developments and transformations that have occurred in the last few years are the result of education and learning. Humans have been involved in different learning processes throughout the history, and web-based education method is one of the education methods that have drawn a great deal of interest in recent years. From a psychological view, this method involves pervasive mind and fosters creative thinking (20). Also, as one of the electronic educational tools, these virtual networks have shown that they can strengthen group critical thinking, team research-based learning, and problem solving ability. use of social networks in education creates multiple interactions that promote cognitive and social skills and individual intelligence through critical thinking, which create a sense of responsibility and independence in individuals, helping them to manage tools and information resources by themselves. These abilities in students increase their tolerance towards different opinions, self-discipline and self-confidence. Virtual education also provides an environment where students can use the experiences of their professors from distance (11).

The results of this study showed that the web-based educational method can promote critical thinking in nursing students,

which is in line with the studies of Amanzadeh (2015), Abbasi (2018), Zhenzhen Yu (2021), and Sivakumar Arunachalam (2020), (8, 21, 22). In a study, Wan-Sheng Peng (2021) taught scenarios with a problem-solving-based teaching method in a combined and integrated manner to pediatric residents, and the results showed that the academic performance was significantly improved in the students of intervention group. Also, the knowledge and skills such as initiating communication, collecting information, giving information, understanding the child's illness and communicating with him/her, and the level of satisfaction with learning was higher in the students of intervention group (23). Considering the mediating role of critical thinking in the academic performance of students (24), it can be acknowledged that the results of this study and our study are similar and congruent. Also, Jonathan S Newsome (2020) stated that students who participated in the focus group discussions believed that virtual patient files, in addition to promoting critical thinking, provide more realistic and attractive experience than paper ones for learning (25). Omidkhoda (2021) in a study reported that students' satisfaction with virtual education was inappropriate and recommended that two education methods should be used in combination (26). The reason for this difference in the results of this study and ours could be the implementation of protocols by the two researchers.

Azad Dosfani (2021) showed that the academic performance of students who participated in face-to-face education improved better than those who participated in virtual education, but no difference was observed in the academic self-efficacy between the two groups. However, the academic progress and self-efficacy of students in the integrated education group were significantly improved compared to other groups, so he recommended the integrated education method (11).

Diane J Morey (2012) in her study showed a significant difference between the students in each group before and after thinking aloud using a rating and rubric tools, in terms of the level of critical thinking and the accuracy of nursing diagnosis, conclusion and evaluation (27), which is in line with our results that indicated virtual teaching of scenarios had a positive effect on nursing students' critical thinking.

In general, it can be said that training and providing support and empowerment programs will play an important role in improving education and quality (28-30).

CONCLUSION

The results of this study showed use of virtual education in teaching clinical scenarios to nursing students was effective in designing nursing process. But according to the contradictory findings in this regard, it is evident that more research is needed to decide on the current strategies for the education and training of nursing students who would be capable of critical thinking and making proper decision. In nursing profession, critical thinking refers to logical thinking about problems of patients who have more than one existential dimension, and also making appropriate decisions in challenging situations. Therefore, this type of thinking enables nurses to make correct judgments about the problems and issues of patients and their health and wellbeing. Thus, teaching critical and creative thinking to nursing students and choosing the right teaching method are important factors that should be considered by nursing instructors and educators.

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