ORIGINAL ARTICLE

The Effect of Problem-Based Learning Clinical Education on Nursing Student's Critical Thinking

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Background: Problem-based clinical education is an effective strategy for enhancing creativity, group work, leadership and problem-solving skills in nursing students. It seems PBL can improve nursing students' critical thinking skills. The aim of this study was to investigate the effects of problem-based clinical education on nursing students' critical thinking.

Methods: This randomized controlled trial was conducted in Kashan University of Medical Science in 2015. In total, 36 nursing students were recruited and were allocated to either the conventional or the problem-based clinical education. A demographic questionnaire and the California Critical Thinking Skills Test, Form B, were used for data collection. Students' critical thinking skills were assessed both at the beginning of their clinical course and one week after it. The SPSS software was employed for performing the independent- and the paired-samples t as well as the Mann-Whitney U tests.

Results: The mean of students' critical thinking score in the conventional clinical education group increased significantly from 10.94±1.85 to 11.88±1.86 (P=0.016). In the problem-based education group, the mean of critical thinking score also increased from 10.72±1.44 to 13.33±1.67 (P=0.0004). Before the study, the groups did not differ significantly regarding the scores of critical thinking. However, the posttest value of critical thinking score in the problem-based education group was significantly higher than the score in the conventional education group.

Conclusions: Both conventional and problem-based clinical educations significantly improved nursing students' critical thinking. However, the problem-based clinical education strategy was more effective than the conventional one.

Keywords: Problem-based learning, Clinical education, Critical thinking

تأثير التعليم المبتنى على حل المسأله عند طلاب التمريض

التمهيد و الهدف: *إن التعليم السريرى عبراسلوب حل المسأله يعتبر اسلوب مؤثر فى مجال رفع مستوى النبوغ و العمل الجماعى و مهارات حل المسأله و القياده عند طلاب التمريض يعتقد أن هذا الاسلوب قد يحسن التفكر انقاد عند الطلاب. تسعى هذه الدراسه الى البحث فى مجال تأثير هذا الاسلوب التعليمى على مهارات التفكرالنقاد عند طلاب التمريض.*

الأسلوب: *تم اجراء هذه الدراسه السريريه على ٣٦ عدد من طلبه التمريض فى جامعه كاشان للعلوم الطبيه و تم اختيارهم بشكل عشوايى و تم تقسيمهم الى فريقين ضبط و اختبار. تم اجراء التعليم السريرى عبر حل المسأله عبرفريق الاختبار و اسلوب التعليم السريرى الإعتيادى عبرفريق الضبط تم استخدام استمارات منقسمه الى قسمين تشتمل على معلومات ديموغرافيه و اختبارات المهاره فى التفكر النقاد فى جامعه كاليفرنيا. لتجميع المعلومات تم تحليل الفكر النقاد عند طلاب فى بدايه الدورة و كذالك بعد اسبوع من انتهاء الدوره. و ايضا تم تحليل المعلومات بواسطه برنامج SPSS و اختبار تى المستقل و تى المستقل و من و يتنى.*

النتائج: *تغيرمعدل علامة التفكرالنقاد عند فريق التعليم السريرى الاعتيادى من (٨٥,١±٨٦,١) قبل الدوره الى (٨٨,١١±٨٦,١) بعد الدوره (P=0.016) و معدل علامه التفكر النقاد عند فريق التعليم السريرى المبتنى على حل المسأله من (٧٢,١٠±٦٧,١) قبل الاختبارالى (٣٣,١٣±٦٧,١) بعد الاختبار (P=0.0004) لم يكن هناك فرق ذو معنى فى علامه الفريقين قبل الاختبار و لكن هناك ارتفاع فى علامه التفكرالنقاد عند طلاب الفريق التعليمى المبتنى على حل المسأله.*

الإستنتاج: *نظرا الى نتائج هذه الدراسه من اختلاف بين الاسلوبين ننصح بأستخدام أسلوب حل المساله فى التدريس.*

كلمات المفتاح: *أسلوب التعلم المبتنى على حل المسأله، التعليم السريرى، التفكر النقاد.*

پرابلم بیسڈ کلینیکل تعلیم کے نرسنگ اسٹوڈنس کی فکر پر اثرات کا جائزہ

بیک گراونڈ: کلینیکل تعلیم میں پرابلم بیسڈ روش اپنانے سے طلباء کی خلاقیت اور ساتھ میں مل کر کام کرنے نیز مسئلے کو حل کرنے کے لئے طلباء کے درمیاں لیڈر شپ کے مسائل حل کرنے میں مدد ملتی ہے۔ ایسا لگتا ہے کہ یہ روش تعلیم طلباءکی تنقیدی صلاحیتوں میں بھی نکھار لاسکتی ہے۔

روش: یہ تحقیق کاشان یونیورسٹی آف میڈیکل سائنسس میں انجام دی گئي۔ اس میں چھتیس طلباء نے شرکت کی تھی جن کے دو گروہ بنائے گئے تھے۔ انہیں رینڈم طریقے سے چنا گیا تھاپہلے گروہ کو پرابلم بیسڈ روش سے تعلیم دی گئي جبکہ دوسرے گروہ کو معمول کی روش سے پڑھا گیا تھا اس تحقیق میں ایک سوالنامہ بھی دیا گیا جس میں ڈیموگرافیک اور کیلی فور نیا فرم بی کے مطابق تنقیدی فکر کی مہارتوں کے بارے میں سوالات کئے گئے تھے۔ٹرم کے آغاز میں اور تنقیدی فکری مہارتوں کے ٹسٹ کے بعد سے طلباء کا ایک بار پھرٹسٹ لیا گیا اور ڈیٹا کا تجزیہ ایس پ ی ایس ایس سافٹ ویر سے گیا گیا

نتیجے: اس تحقیق سے معلوم ہوتا ہے کہ پرابلم بیسڈ روش طلباء کی صلاحیتوں کو بڑھانے میں کامیاب روش ہے اسی کو زیادہ نمبر ملے ہی۔

سفارش: اگرچہ دونوں روشوں سے طلباء کی تنقیدی فکری صلاحیتوں کو جلا ملی ہے لیکن جس گروہ کو پرابلم بیسڈ روش سے تعلیم دی گئي تھی وہ ان کی کارکردگي بہتر تھی لھذا اس روش سے طلباء کی تنقیدی فکری صلاحیتیں بڑھائي جاسکتی ہیں۔

کلیدی کلمات: روش، کلینیکل تعلیم، تنقیدی فکر ۔

تاثیر آموزش بالینی مسئله محور بر تفکر انتقادی دانشجویان پرستاری

زمینه و هدف: آموزش بالینی به روش حل مساله یک استراتژی موثر برای تقویت خلاقیت، کارگروهی، مهارتهای حل مساله و رهبری در دانشجویان پرستاری می باشد. به نظر میرسد این روش اموزشی بتواند مهارت تفکر انتقادی دانشجویان را نیز بهبود ببخشد. این مطالعه با هدف بررسی تاثیر این روش آموزشی بر مهارتهای تفکر انتقادی دانشجویان پرستاری انجام شد.

روش: مطالعه به صورت کارآزمایی بالینی در دانشگاه علوم پزشکی کاشان روی ۳۶ دانشجوی پرستاری که به روش تصادفی ساده در دو گروه کنترل و آزمون قرار گرفتند انجام شد. آموزش بالینی به روش حل مساله در گروه آزمون و آموزش بالینی به روش معمول در گروه کنترل اجراشد. از پرسشنامه دو قسمتی شامل اطلاعات دموگرافیک و آزمون مهارت های تفکر انتقادی کالیفرنیا فرم ب برای جمع آوری اطلاعات استفاده شد. ابتدای دوره و یک هفته بعد از انتهای مداخله مهارت تفکر انتقادی دانشجویان مورد بررسی قرار گرفت. با کمک نرم افزار SPSS و آزمون های تی مستقل، تی زوجی و من ویتنی تجزیه و تحلیل اطلاعات انجام شد.

یافته ها: میانگین نمره تفکر انتقادی در گروه آموزش بالینی معمول از ۱/۸۵ ±۱۰/۹۸ قبل از ارائه آموزش به ۱/۸۶ ±۱۱/۸۸ بعد از ارائه آموزش تغییر کرد (p=۰/۰۱۶) و میانگین نمره تفکر انتقادی در گروه آموزش بالینی حل مساله از ۱/۴۴ ±۱۰/۷۲ در پیش آزمون به ۱/۶۷ ±۱۳/۳۳ در پس آزمون افزایش یافت (p=۰/۰۰۰۴). میانگین قبل از مداخله دو گروه از نظر نمره تفکر انتقادی دانشجویان تفاوت معناداری نداشتند اما بعد از مداخله نمره تفکر انتقادی درگروه اموزش حل مساله نسبت به اموزش معمول بالاتر بود.

نتیجه گیری: اگرچه دو شیوه آموزش بالینی تفکر انتقادی دانشجویان را نسبت به قبل افزایش داد. مهارت تفکر انتقادی درآموزش بالینی حل مساله نسبت به آموزش بالینی معمول افزایش بیشتری نشان داد. می توان در آموزش بالینی از روش حل مساله برای افزایش مهارت تفکر انتقادی دانشجویان استفاده کرد.

کلمات کلیدی: روش یادگیری حل مساله، آموزش بالینی، تفکر انتقادی

INTRODUCTION

Educational systems worldwide are searching for the most effective teaching strategies in order to foster thoughtful critical thinkers (1, 2). Critical thinking (CT) and independent information-seeking skills are the prerequisites to informed decision making (3). CT is a cognitive activity and an organized subjective attempt which employs skills such as data analysis and reasoning for evaluating and understanding phenomena and their interrelationships (4, 5).

CT is essential to sound clinical practice (4, 6). During their daily practice, nurses face different novel and problematic situations. Accordingly, they need to have considerable professional knowledge and skills (such as data collection, data analysis, decision-making, and clinical judgment) in order to develop and employ sound strategies for effectively managing such situations (6–8). CT can facilitate this process and empower nurses to accurately assess patients, identify their needs, and employ the most effective strategies for providing quality care and fulfilling the identified needs (3, 6, 7, 9).

Recently, CT has been incorporated into the educational curriculum of nursing (7, 10, 11). Nonetheless, little attention is being paid to educating this skill to nursing students (12). Previous studies have shown that nursing students have limited CT ability (3, 4, 9, 10). For instance, in studies conducted by Gazer et al. (2010) and Kawashima and Petrini (2001), nursing students achieved low CT scores (3, 10). Eslami and Maarefi (2008) and Taheri et al. (2006) evaluated Iranian nursing students' CT and reported the same finding (4, 9).

Nursing instructors usually strive to employ strategies for developing students' CT ability (13). One of the effective strategies for helping them manage novel situations in their daily practice is problem-based learning (13). Problem-based learning (PBL) was first introduced and employed by McMaster University, Canada, in 1960. PBL is a student-centered learning strategy in which students from small groups and work together to identify problems, collect the necessary data about it, and understand and manage their problems (14, 15). Accordingly, PBL necessitates self-directedness and collaborative work. In other words, PBL teaches students how to learn (11).

Previous studies have investigated the effects of PBL in theoretical nursing education. The results of a qualitative study conducted by Klunklin et al. (2011) revealed that Thai students perceived PBL as an effective strategy for enhancing their creativity, group work, leadership, CT, and problem-solving skills (14). Students who had participated in a study done by Yuan et al. (208) also noted that PBL improves nursing students' CT skills (16). Other studies also showed that compared with traditional teaching methods, PBL significantly improved nursing students' CT scores (17, 18). However, Worrell and Profetto-McGrath (2007) and Oja (2011) highlighted that inadequate evidence exists regarding the effectiveness of PBL on nursing students' CT skills and hence, further studies are needed for providing decisive evidence (19, 20). On the other hand, Ehrenberg and Haggblom (2007) reported that PBL has not yet been applied to clinical nursing education (21). This study was undertaken to bridge this gap. The aim of the study was to investigate the effects of problem-based clinical education on nursing students' CT.

METHODS

This single-blind cluster randomized controlled trial was conducted in 2015 in the Nursing and Midwifery Faculty of Kashan University of Medical Sciences, Kashan, Iran. All 36 students who had taken the Heart and Lung Medical-Surgical Clinical Course in the second semester of the educational year of 2015 were recruited by using the census method. The inclusion criteria were having taken the aforementioned course at the time of the study and having passed the Heart and Lung Care Medical Surgical Theoretical Course. Students were excluded if they did not attend the clinical course regularly or opted to continue their education at another university. This study was conducted from September 2015 to December 2015.

The California Critical Thinking Skills Test, Form B (CCTS-B), was used for data collection. The CCTS-B specifically evaluates CT ability at post-high school level and contains 34 five-choice questions in five areas including interpretation, analysis, evaluation, inductive reasoning, and deductive reasoning. Right and wrong answers are scored 1 and 0, respectively. Accordingly, the total score of the scale ranges from 0 to 34 (22, 23).

The CCTS Form B was previously translated into Persian language by Akhoundzadeh et al.(24) And showed appropriate psychometric properties. They also confirmed the instrument's content validity and reliability using Kouder-Richardson coefficient that was 0.62. The test was able to distinguish between CTS in nursing and philosophy students (25).

At the first session of their clinical course, all students in each group were asked to complete the CCTS-B within 45 minutes. Then, they were subjected to clinical education either by using the conventional or the problem-based methods. Problem-based clinical education was provided in six steps as follows. First, we provided information about PBL method to students. In the second step, students were presented with a problematic situation. Accordingly, they were asked to assess patients, take their medical history, identify their problems, and establish relevant nursing diagnoses. In the third step, they were guided and asked to collect necessary data about the identified problems. The fourth step was related to formulating hypotheses on possible nursing measures for resolving patients' problems. In the fifth step, students tested their hypotheses through implementing the developed nursing measures. In the last step, they evaluated their interventions, made conclusions, and generalized their findings. Clinical education in the conventional group was provided by using the case method and the seminar discussion methods. The length of intervention for each of the four groups was 27 hours (two 4.5-hour sessions a week for three consecutive weeks). One week after each intervention, students were invited to recomplete the CCTS-B within 40 minutes.

Ethical considerations

Official approvals were obtained from the Institutional Review Board and the Ethics Committee of Kashan University of Medical Sciences, Kashan (Grand Number: 9478). The confidentiality of participants' data was guaranteed and all of them signed the informed consent form of the study.

Data analysis

Study data were analyzed by using the SPSS v. 16.0. Primarily, the Kolmogrov-Smirnoc test was performed for comparing the distributions of the study variables with the normal distribution. Accordingly, the independent-samples t, the paired-samples t, the Chi-square, and the Mann-Whitney U tests were used for data analysis. A p-value less than 0.05 was assumed as significant.

RESULTS

Totally, 36 students participated in the study among whom; one student was excluded due to his irregular attendance

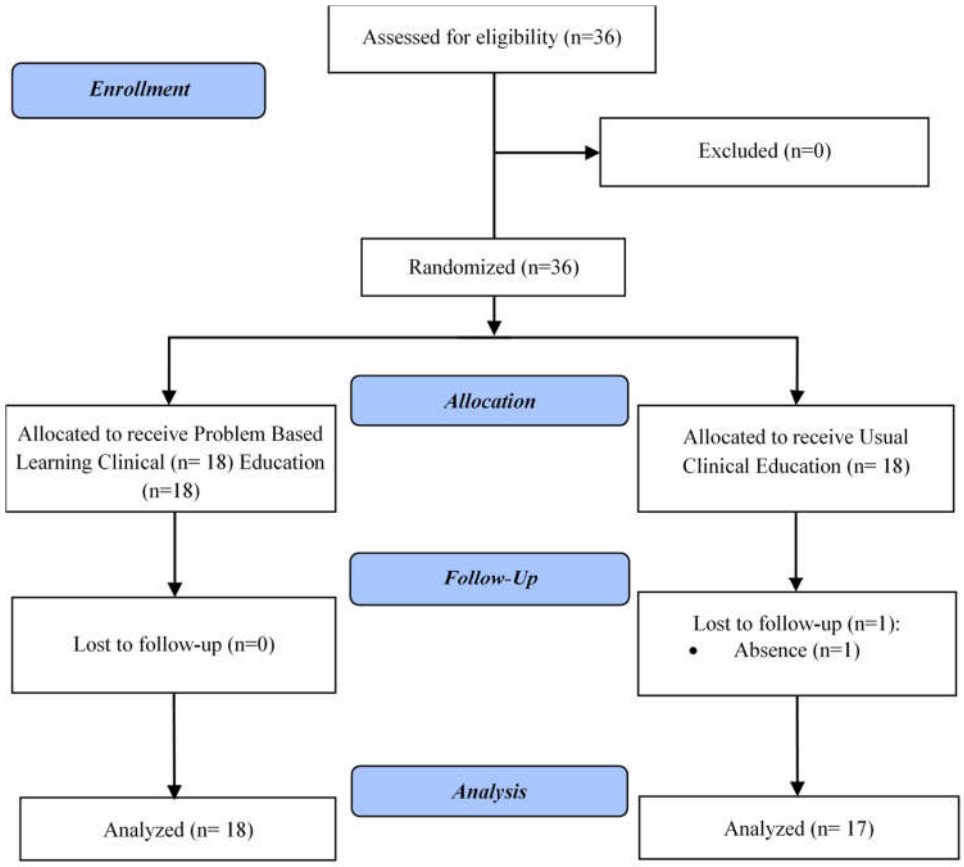

Figure 1. Consort flow diagram

Table 1. The comparison of demographic information between two groups.

Group		Problem-based clinical education N (%)	Conventional clinical education N (%)	P value
Gender	male	7 (38.9)	5 (29.4)	P = 0.72†
	Female	11 (61.1)	12 (70.6)	
Age		Mean ±SD	Mean± SD	
		20.94±0.72	20.59±0.61	P = 0.18††
Three-year grade point average		16.88±0.73	16.96±0.56	P = 0.72††

† Chi-square
††Mann-Whitney

Table 2. The comparison of Critical thinking score before and after the intervention in two groups.

Group	Problem-based clinical education	Conventional clinical education	P value†
Critical thinking score	Mean ±SD	Mean± SD	
Before clinical education	10.72±1.44	10.94±1.85	P = 0.69
After clinical education	13.33±1.67	11.88±1.86	P = 0.021
P value††	P = 0.0004	P = 0.016	

†T-test
†† Paired t-test

Table 3. The comparison of the mean of difference between before and after critical thinking score in two groups.

Domains in critical thinking skills	difference between before and after score in problem-based clinical education	difference between before and after score in conventional clinical education	P value†
Evaluation	0.16±0.92	0.05±0.82	P = 0.67
Analysis	0.94±0.53	0.11±0.85	P = 0.0004
Interpretation	1.05±0.63	0.17±0.95	P = 0.005
Deductive reasoning	1.38±0.50	0.94±0.55	P = 0.02
Inductive reasoning	0.33±0.68	0.29±0.68	P = 0.85

† Mann-Whitney

at the course (Figure 1). The mean of the participants' ages was Whitney U and the Chi-square tests showed that before the study, there were no significant differences between the groups regarding participants' age, gender, and three-year grade point average (P value > 0.05; Table 1).

The independent-samples t test revealed no significant difference between the two groups concerning the pretest values of CCTS-B scores (P value 0.69). However, after the intervention, the students in the problem-based education group obtained significantly higher CCTS-B scores than the students in the conventional clinical education group (P value = 0.021; Table 2). Moreover, the paired-samples t test demonstrated that the posttest values of CT in both groups were significantly higher than the pretest values. In other words, both conventional and problem-based clinical educations significantly improved students' CT ability. Finally, the Mann-Whitney U test indicated that the within-group pretest-posttest mean differences of the analysis, inductive reasoning, and inference domains in the problem-based education group were significantly higher than those of the conventional clinical education group (P value < 0.05; Table 3).

DISCUSSION

This study was undertaken to investigate the effects of problem-based clinical education on nursing students' CT. Study findings revealed that the pretest-posttest mean difference of CCTS-B score in the problem-based education group was 2.77 times more than the conventional clinical education group (2.61 vs. 0.94, respectively). This difference was statistically significant. In other words, problem-based clinical education was more effective than conventional clinical education in improving nursing students' CT ability. Previous studies have not evaluated the effects of problem-based clinical education on students' CT. However, several studies have been done to evaluate the effects of problem-based theoretical nursing education on students' CT ability. For instance, a quasi-experimental study conducted by Ozturk et al. (2008) showed that problem-based education was more effective than traditional lecture-based education in enhancing students' CT ability (17). Yuan et al. (2008) also reported that compared with lecture method, problem-based education had stronger effects on students' CT ability (16). Problem-based clinical education helps students assess patients more carefully and identify their problems and needs more accurately. This technique enables them to critically analyze a given situation and seek all possible solutions to the existing problems. According to Yuan et al. (2008), PBL techniques such as data collection, data sharing, small group discussions, hypothesis making, and hypothesis testing are all effective in enhancing students' CT ability (16).

Study findings also revealed that problem-based clinical education significantly improved students' inference, inductive reasoning, and analysis skills. Yuan et al. (2008) also found that compared with lecture method, problem-based education was more effective in improving students' analysis and deductive reasoning skills (16). Hosseini et al. (2014) also reported that an active education approach significantly enhanced students' analysis and deductive reasoning skills (26). Students who had participated in a study conducted by Barrow et al. (2002) also referred to problem-based education as an effective means for

improving their exploration, group discussion and work, clinical reasoning, and evaluation skills (27). As a student-centered teaching approach, problem-based clinical education provides students with a participatory and interactive learning environment and actively involves them in their learning. In this approach, students need to assess a situation and all associating problems and search for the best solutions. Accordingly, PBL encourages them to thoughtfully analyze the situation and make reasonable inferences (16).

The present study investigated the effects of problem-based clinical education on only students' CT ability. However, previous studies reported that beside CT ability, this teaching strategy also improves students' exploration, group discussion and work, clinical reasoning, and self-directed skills, enhances their pleasure in learning, and promotes their in-depth learning (27–29). Panjehpour and Ataei (2012) also found that Iranian students' satisfaction with problem-based education was about 70% (30). Ehrenberg and Haggblom (2007) and Chou and Chin (2009) also reported that students consider problem-based education as a great experience which promotes their freedom in learning and requires them to assume greater responsibility towards their own learning (19, 31). Accordingly, this strategy can be used as an effective teaching strategy for improving students' CT ability, promoting their learning, and enhancing their satisfaction.

Both conventional and problem-based clinical educations significantly improved nursing students' critical thinking. However, the problem-based clinical education strategy was more effective than the conventional one. Given the limited effectiveness of current teaching strategies in improving students' CT, it is recommended to incorporate problem-based education into nursing clinical education.

The study limitation was its relatively small sample size. Accordingly, conducting large-scale studies for investigating the effects of problem-based clinical education on students' CT ability, learning, and satisfaction with learning is recommended.

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