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

Background: Problem-based clinical education is an effective strategy for enhancing creativity, group work, leadership and problem-solving skills in nursing students. It seems FBL 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 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 as well as the Mann-Whitney U tests.

Results: The mean of students' critical thinking score in the conventional education group increased significantly from 10.94±1.85 to 11.88±1.86 (P=0.004). The student's critical thinking score also increased from 10.72±1.44 to 13.33±1.91 (P=0.016). 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 problem-based 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

PENDAHULUAN

Penelitian pada bidang kesehatan memainkan peran yang sangat penting dalam pemahaman dan peningkatan keterampilan kritik belajar peserta didik, terutama dalam keterampilan belajar kritis. Penelitian ini bertujuan untuk mengetahui perbedaan kinerja kritis belajar peserta didik kelas terdapat baik yang menerima pembelajaran kritis berbentuk pendekatan pembelajaran berorientasi masalah (PBL) maupun pembelajaran konvensional. Metode penelitian yang digunakan adalah metode quasi eksperimental dengan rancangan eksperimen klasik. Variabel terikat pada penelitian ini adalah kinerja kritis belajar peserta didik, variabel independen adalah tipe pembelajaran yang diterapkan (konvensional maupun PBL). Responden penelitian ini adalah 36 siswa dikelas XI di salah satu SMK di Kec. Banyumas, Bantul, DI Yogyakarta. Hasil penelitian menunjukkan bahwa peserta didik yang menerima pembelajaran kritis berbentuk pendekatan pembelajaran berorientasi masalah (PBL) secara signifikan lebih baik dibandingkan peserta didik yang menerima pembelajaran konvensional. Implikasi penelitian ini adalah pentingnya adanya pendekatan pembelajaran berorientasi masalah (PBL) dalam pembelajaran kritis belajar peserta didik dalam pendidikan kesehatan. Implementasi pendekatan pembelajaran berorientasi masalah (PBL) diharapkan dapat meningkatkan kualitas pembelajaran kritis belajar peserta didik dalam pendidikan kesehatan.
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 (5, 4, 9, 10). For instance, in studies conducted by Gazer et al. (2010) and Kawashima and Petrin (2001), nursing students achieved low CT scores (3, 10). Esfami 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 (15). 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 Hagglom (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 54 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 54 (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 Kuder-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-Smirnov 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

![Consort flow diagram]

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

<table>
<thead>
<tr>
<th>Group</th>
<th>Problem-based clinical education</th>
<th>Conventional clinical education</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7 (39.9)</td>
<td>5 (29.4)</td>
<td>P = 0.72†</td>
</tr>
<tr>
<td>Female</td>
<td>11 (61.1)</td>
<td>12 (70.6)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.94±0.72</td>
<td>20.59±0.61</td>
<td>P = 0.18††</td>
</tr>
<tr>
<td>Three-year grade point average</td>
<td>16.88±0.73</td>
<td>16.96±0.56</td>
<td>P = 0.72††</td>
</tr>
</tbody>
</table>

† Chi-square
††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 clinical 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

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

<table>
<thead>
<tr>
<th>Group</th>
<th>Problem-based clinical education</th>
<th>Conventional clinical education</th>
<th>P value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical thinking score</td>
<td>Mean ±SD</td>
<td>Mean ±SD</td>
<td></td>
</tr>
<tr>
<td>Before clinical education</td>
<td>10.72±1.44</td>
<td>10.94±1.85</td>
<td>P = 0.69</td>
</tr>
<tr>
<td>After clinical education</td>
<td>13.33±1.67</td>
<td>11.88±1.86</td>
<td>P = 0.021</td>
</tr>
<tr>
<td>P value††</td>
<td>P = 0.0004</td>
<td>P = 0.016</td>
<td></td>
</tr>
</tbody>
</table>

† T-test
†† Paired t-test

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

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

† Mann-Whitney
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 Hagglom (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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Conflict of interest: The authors declare no conflict of interest.

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