Critical Thinking and the Use of Nontraditional Instructional Methodologies
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ABSTRACT
Background: The purpose of this study was to examine the relationship between critical thinking and the use of concept mapping (CM) and problem-based learning (PBL) during care plan development. Method: A quasi-experimental study with a pretest–posttest design was conducted using a convenience sample (n = 49) of first-semester undergraduate baccalaureate nursing students. Critical thinking was measured using the Holistic Critical Thinking Scoring Rubric. Data analysis consisted of a repeated measures analysis of variance with post hoc mean comparison tests using the Bonferroni method. Results: Findings indicated that mean critical thinking at phase 4 (CM and PBL) was significantly higher, compared with phase 1 (baseline), phase 2 (PBL), and phase 3 (CM [p < 0.001]). Conclusion: The results support the utilization of nontraditional instructional (CM and PBL) methodologies in undergraduate nursing curricula. [J Nurs Educ. 2015;54(8):455-459.]

Critical thinking has become an essential competency that undergraduate nursing students must develop due to the increasing complexity of patient care (Newton & Moore, 2013; Potgieter, 2012). According to Facione (1990), critical thinking skills is the process of interpretation, analysis, evaluation, inference, explanation, and self-regulation. The ability to think critically is a vital component of the nursing process; it provides a means for processing information efficiently, evaluating individual practice, and improving the quality of nursing care delivered (Huckabay, 2009; Kalisch & Begeny, 2010). The acquisition of critical thinking skills enables bedside application of nursing theory, education, experience, and evidence-based practice.

To develop critical thinking skills among undergraduate nursing students, the integration of nontraditional instructional methodologies in curricula is essential (Eng & Duke, 2003; Standing, 2007). The purpose of the current quantitative study was to examine the development of critical thinking among first-semester undergraduate nursing students when nontraditional instructional methodologies (concept mapping [CM] and problem-based learning [PBL]) are utilized during nursing care plan development. This study sought to answer two research questions:

● Does using PBL during care plan development increase critical thinking in first-semester undergraduate nursing students?
● Does using CM with PBL during care plan development increase critical thinking in first-semester undergraduate nursing students?

Literature Review
Prior research has shown that nontraditional instructional methodologies (e.g., CM and PBL) in undergraduate nursing curricula are effective in stimulating critical thinking development (Hicks-Moore & Pastirik, 2006; Kocaman, Dicle, & Ugur, 2009; Kowalczyk, 2011; Wheeler & Collins, 2003). As described by Banfield, Fagan, and Janes (2012), nontraditional instructional methodologies foster learning through discovery and collaboration, thus encouraging students to be active and self-directed in their learning. In addition, learning occurs through the process of sharing ideas, opinions, and experiences.

Concept maps provide a visual representation of actual or potential health issues (Taylor & Wros, 2007). Moreover, concept maps assist students in developing patient-specific care...
plans by enabling them to synthesize, organize, and prioritize pertinent information logically (Taylor & Wros, 2007; Wilgis & McConnell, 2008). Research examining CM has demonstrated a strong correlation with increased critical thinking skills and dispositions when CM is integrated into undergraduate nursing curricula (Atay & Karabacak, 2012; Huang, Chen, Yeh, & Chung, 2012; Moattari, Soleimani, Moghaddam, & Mehbodi, 2014; Taylor & Wros, 2007; Wilgis & McConnell, 2008).

PBL is a student-centered learning approach. Under the PBL process, learning occurs within small groups working collaboratively to seek solutions (Yuan, Kunaviktikul, Klunklin, & Williams, 2008). Five steps form the basic process of PBL: (a) review the case, (b) analyze actual or potential health issues, (c) identify knowledge gaps, (d) conduct research, and (e) develop an action plan. Prior research that investigated PBL reported increased engagement, self-direction, satisfaction, motivation, and autonomy (Hwang & Kim, 2006; Lin, Lu, Chung, & Yang, 2010; Ozturk, Muslu, & Dicle, 2008; Smith & Coleman, 2008; Tiwari, Lai, So, & Yuen, 2006; Yuan et al., 2008).

Method

A quasi-experimental pretest–posttest design was used to examine critical thinking among a convenience sample of first-semester undergraduate nursing students during nursing care plan development. After receiving institutional review board approval, the study was conducted in fall 2013 at a university located in the western United States. First-semester undergraduate nursing students enrolled in the Nursing Fundamentals course (N = 56) were invited to participate. All 56 students accepted, signed informed consent forms, and completed a demographic questionnaire. The student population included women (76.8%) and men (23.2%) between the ages of 18 and 22 (58.9%), 23 and 27 (17.9%), 28 and 32 (10.7%), 33 and 37 (7.1%), and older than age 37 (5.4%), with an ethnic distribution of White (39.3%), Hispanic (33.9%), Asian/Pacific Islander (21.4%), Indian (3.6%), and Native American (1.8%) students.

The Holistic Critical Thinking Scoring Rubric (HCTSR) by Facione and Facione (1994) was used to measure critical thinking level. The HCTSR has a numerical scale (1 = significantly weak, 2 = unacceptable, 3 = acceptable, 4 = strong), with specific criteria to measure critical thinking levels based on six core processes: interpretation, analysis, evaluation, inference, explanation, and self-regulation. After receiving institutional review board approval, a pilot study, with a convenience sample of 20 participants, was conducted in spring 2012 to determine the reliability of the HCTSR. A critical thinking score was determined for each component of the nursing care plans: assessment, nursing diagnosis, goals, outcomes, interventions, and evaluation. A mean score was calculated from the six component scores. Cronbach’s alpha was calculated to be 0.88 for the HCTSR. Facione and Facione (1994) had established face validity in prior research. Content validity was supported by the critical thinking criteria outlined in the HCTSR. Construct validity was established by the definition of critical thinking provided by Facione (1990) in The Delphi Report.

The current investigators prepared all of the content material and then taught the nursing process and fundamentals of care plan development to the participants during weeks 6 and 7, using lecture and group discussion as primary teaching modalities. During this period, the students developed a nursing care plan based on an in-class case study. At semester week 10, CM was introduced and used to facilitate learning of the nursing process and care plan development. Students were provided with an opportunity to utilize CM in developing an individualized nursing care plan based on an in-class case study. Students were also given an example of a concept map as a resource. For the in-class case plan day 2 (semester week 11), students were instructed to create and submit a concept map, in addition to their nursing care plan. The investigators reviewed the concept maps for content and critical thinking analysis; however, a critical thinking score was not assigned.

PBL was used as the primary instructional methodology during care plan days 1 (semester week 8) and 2 (semester week 11). For each care plan day, students were instructed to develop a nursing care plan utilizing the case study that the investigators provided. Care plan days consisted of two 1-hour sessions, when students met with mentors to discuss their proposed plan of care. Mentors for care plan days were second- to sixth-semester undergraduate nursing students. The role of the mentor was to facilitate the discussion of the case study and application of the nursing process. Mentors encouraged students to critically think through the case study, using trigger questions provided by the authors. No more than two students were randomly assigned to a mentor. Prior to each care plan day, the investigators met with the mentors to review and discuss the

### TABLE 1

<table>
<thead>
<tr>
<th>Week</th>
<th>Phase</th>
<th>Intervention</th>
<th>Data Collection*</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 and 7b</td>
<td>1</td>
<td>Lecture: Nursing process</td>
<td>No data collected</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Care plan day 1 (PBL)</td>
<td>Care plan 1 (pretest)</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>No intervention</td>
<td>Care plan 2 (posttest)</td>
</tr>
<tr>
<td>10b</td>
<td>3</td>
<td>CM</td>
<td>No data collected</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>Care plan day 2 (PBL + CM)</td>
<td>Care plan 3 (pretest)</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>No intervention</td>
<td>Care plan 4 (posttest)</td>
</tr>
</tbody>
</table>

Note. PBL = problem-based learning; CM = concept mapping.

* All care plans were collected at the start of class.

b Case study 1 was assigned at week 7, and case study 2 was assigned at week 10.
assigned case study. Students submitted a total of four nursing care plans for the study. Care plans were written outside of classroom time and were graded. Critical thinking scores did not influence grades, nor were grades associated with the study. Steps for data collection are summarized in Table 1.

Data were analyzed using SPSS®, version 22, software. To determine the mean significant differences in critical thinking after the utilization of nontraditional instructional methodologies, a repeated-measures analysis of variance (ANOVA) was conducted. Descriptive statistics—age, gender, ethnicity, highest educational degree received, and employment status—were calculated from the demographic survey. Inferential statistics were calculated from the nursing care plan critical thinking scores.

Results

Although 56 students provided written consent and completed the demographic questionnaire at the start of the study, only 49 students submitted copies of all four care plans. Therefore, the analysis of critical thinking scores is reflective of the 49 students who submitted four care plans during data collection. Using the HCTSR, critical thinking was assessed for each of six dimensions (assessment, nursing diagnosis, goals, outcomes, interventions, and evaluation). As shown in Table 2, critical thinking was higher in the dimensions of assessment, nursing diagnosis, goals, and outcomes, compared with interventions and evaluation.

Research question 1 asked “Does using PBL during care plan development increase critical thinking in first-semester undergraduate nursing students?” The differences in critical thinking after the utilization of PBL were determined using a repeated-measures ANOVA. Results of the ANOVA, using the Greenhouse-Geisser correction, indicated that significant differences were found at each phase of data collection (Wilks’$\lambda = 0.064, F(2.433, 116.783) = 319.279, p < 0.001$), and that the effect size for each phase was large ($\eta^2 = 0.869$). Post hoc mean comparison tests, using the Bonferroni method, were conducted with each pairwise comparison tested at the 0.013 level of significance. Results of the post hoc tests indicated that mean critical thinking at phase 3 ($M = 2.939, SD = 0.242$) was significantly higher, compared with phase 2 ($M = 2.306, SD = 0.466$) and phase 1 ($M = 1.449, SD = 0.503; p < 0.001$). A summary of statistics for critical thinking after each phase of data collection is presented in Table 3.

Discussion

Care plan days challenged the students’ ability to articulate clinical reasoning and decision-making skills related to each step of the nursing process (assessment, nursing diagnosis, outcome identification, planning, implementation, and evaluation). During care plan day 1, students had difficulty communicating to their mentor the three areas related to the nursing process—planning, implementation, and evaluation. Trigger questions provided to the mentors assisted students in discerning actual versus potential health issues by prompting students to discuss the disease process, relevant assessment findings, and perceived health issue problems. This process facilitated further discussion between the student and the mentor of selected goals, outcomes, and interventions. For care plan day 2, students had less difficulty describing the proposed plan of care when prompted by mentors with trigger questions. Students shared that CM enabled them to have a better overall understanding of the relationship between actual and potential health problems. CM facilitated further reflection of identified health problems by encouraging students to have a more holistic approach to care. Although the students still experienced some difficulty in describing their plan of care, they demonstrated greater clinical reasoning and decision-making skills related to planning and implementation. The mentors told the investigators that students actively engaged in learning through collaboration and by sharing their knowledge and research.

At the study’s completion, the students reported that they felt more competent developing nursing care plans. With each care plan submission, critical thinking became more evident. Students were able to accurately identify actual health issues versus potential health issues, provide sound rationales, analyze

### Table 2

Means and Standard Deviations of Participants’ ($n = 49$) Critical Thinking Scores by Dimension and Phase

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Baseline (Phase 1)</th>
<th>PBL (Phase 2)</th>
<th>CM (Phase 3)</th>
<th>PBL + CM (Phase 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>1.224 (0.422)</td>
<td>2.204 (0.407)</td>
<td>2.735 (0.446)</td>
<td>3.694 (0.466)</td>
</tr>
<tr>
<td>Nursing diagnosis</td>
<td>1.673 (0.474)</td>
<td>2.408 (0.497)</td>
<td>2.857 (0.354)</td>
<td>3.776 (0.422)</td>
</tr>
<tr>
<td>Goals</td>
<td>1.388 (0.492)</td>
<td>2.327 (0.474)</td>
<td>2.755 (0.480)</td>
<td>3.694 (0.466)</td>
</tr>
<tr>
<td>Outcomes</td>
<td>1.531 (0.504)</td>
<td>2.469 (0.504)</td>
<td>2.837 (0.373)</td>
<td>3.673 (0.474)</td>
</tr>
<tr>
<td>Interventions</td>
<td>1.408 (0.497)</td>
<td>2.184 (0.391)</td>
<td>2.776 (0.422)</td>
<td>3.469 (0.504)</td>
</tr>
<tr>
<td>Evaluation</td>
<td>1.327 (0.474)</td>
<td>2.204 (0.456)</td>
<td>2.714 (0.456)</td>
<td>3.449 (0.542)</td>
</tr>
<tr>
<td>HCTSR</td>
<td>1.449 (0.503)</td>
<td>2.306 (0.466)</td>
<td>2.939 (0.242)</td>
<td>3.714 (0.456)</td>
</tr>
</tbody>
</table>

Note. PBL = problem-based learning; CM = concept mapping; HCTSR = Holistic Critical Thinking Score Rubric.
and evaluate proposed actions, draw astute conclusions, and justify key clinical decisions. The results of this study provide further evidence regarding the effectiveness of utilizing CM and PBL to stimulate critical thinking during care plan development. Prior research examining critical thinking, CM, and PBL have reported similar results (Atay & Karabacak, 2012; Huang et al., 2012; Kocaman et al., 2009; Lin et al., 2010; Moattari et al., 2014; Ozturk et al., 2008; Smith & Coleman, 2008; Taylor & Wros, 2007). Although repeated experiences may have contributed to improved care plan development, previous studies evaluating critical thinking using a pretest–posttest design have demonstrated similar findings (Atay & Karabacak, 2012; Wilgis & McConnell, 2008; Yuan et al., 2008).

Future research should include additional studies investigating the utilization of nontraditional instructional methodologies during nursing care plan development, examination of CM and PBL in undergraduate nursing curricula, and replication of the current study to further validate the need to integrate CM and PBL in undergraduate nursing curricula. Also, a study examining CM and PBL, compared with traditional instructional methodologies, would be beneficial. For generalization, a study evaluating critical thinking using a pretest–posttest design have demonstrated similar findings (Atay & Karabacak, 2012; Wilgis & McConnell, 2008; Yuan et al., 2008).

TABLE 3
Mean, Standard Deviation, and Standard Error of Participants’ (n = 49) Critical Thinking After Phases 1 Through 4

<table>
<thead>
<tr>
<th>Source</th>
<th>M</th>
<th>SD</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 (baseline)</td>
<td>1.449</td>
<td>0.503</td>
<td>0.072</td>
</tr>
<tr>
<td>Phase 2 (PBL)</td>
<td>2.306</td>
<td>0.466</td>
<td>0.067</td>
</tr>
<tr>
<td>Phase 3 (CM)</td>
<td>2.939</td>
<td>0.242</td>
<td>0.035</td>
</tr>
<tr>
<td>Phase 4 (PBL + CM)</td>
<td>3.714</td>
<td>0.456</td>
<td>0.065</td>
</tr>
</tbody>
</table>

*Note: SE = standard error; PBL = problem-based learning; CM = concept mapping.*

Conclusions

The demands of today’s health care system have added critical thinking as a required dimension of learning in undergraduate nursing curricula. Nurse educators are faced with the challenge of producing new graduate nurses who have efficient and effective critical thinking skills equivalent to seasoned nurses. Findings from this study suggest that CM and PBL are effective nontraditional instructional methodologies in facilitating the acquisition of critical thinking competencies. The current study also made a unique contribution to the literature by showing that higher critical thinking ability was evident after the introduction of CM and PBL during care plan development. Unlike traditional teaching methodologies, CM and PBL facilitate self-directed learning and nonlinear thinking. Students demonstrated increased clinical reasoning and decision-making skills when CM and PBL were applied during nursing care plan development. When used in combination, CM and PBL enabled students to have a better understanding of the clinical situation, as well as having a holistic approach to providing care. CM and PBL challenged students to analyze and evaluate pertinent information before proposing a solution.

New nurse graduates are faced with a patient care environment that is becoming increasingly complex, and these new nurses will be challenged to process information efficiently and effectively (Huckabay, 2009). Critical thinking allows for reflection on individual practice and the delivery of quality patient care (Kalisch & Begeny, 2010); therefore, positive patient outcomes are ultimately influenced by critical thinking ability. For successful transition of new graduates in the health care setting, nurse educators are key stakeholders in facilitating the development of critical thinking among nursing students. Use of nontraditional teaching methodologies, such as CM and PBL, show significant promise for developing critical thinking competencies in nursing students, particularly in nursing care plan development.

References


