ABSTRACT
In preparation for the progressive nature of today’s acute care hospital environments and the requirements for safe and effective patient care, it is essential that nursing students learn how to think critically. Problem-based learning is a method of education designed to encourage critical thinking. This article examines the evidence regarding the use of problem-based learning to improve critical thinking. A review of published literature was conducted using the CINAHL, ERIC, PsychInfo, and PubMed databases with the keywords nursing, problem-based learning, and critical thinking. Although the evidence is still accumulating, the studies reviewed indicate a positive relationship between problem-based learning and improved critical thinking in nursing students. There is a need for more rigorous research on the use of problem-based learning to examine the effects on critical thinking. Until this occurs, nursing instructors must rely on the extant evidence to guide their practice or continue to use the traditional model of clinical nursing education.

Todays new graduate nurses are exposed to increasingly demanding and complex acute care environments that require an ability to effectively think and reason to provide quality patient care (Kautz, Kuiper, Pesut, Knight-Brown, & Daneker, 2005). To adequately prepare nursing students for practice in these environments, the American Association of Colleges of Nursing and the National League for Nursing Accrediting Commission expect new graduate nurses to demonstrate critical thinking skills (Emerson, 2007). Based on Greek philosophy and the teaching methodologies of Socrates and Plato (Kuiper & Pesut, 2004), critical thinking has been defined as “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (Facione, 1990, p. 3). In the traditional model of prelicensure clinical nursing education, students are placed in acute care settings (typically with a faculty-to-student ratio of 1 to 10), learn by providing care for one or two patients, and are more involved in performing routine tasks and hands-on procedures than the development of critical thinking (Tanner, 2006). Although many nursing faculty use students’ care plans as tools for the development of critical thinking, others deem that this teaching method is insufficient (Staib, 2003).

Problem-based learning (PBL) is a student-centered, inquiry-based method of instruction that guides students to solutions of real-world problems through cooperative group work (Duch, Groh, & Allen, 2001) and is purported to build critical thinking skills. Originally used as a teaching method for physicians, PBL includes the following components (Jones, 2008):

- Nonlecture format with the teacher as facilitator.
- The presentation of real-world situations or “problems” that expand on previous learning.
- Student group work and discussion.
- Student-directed solution of the problem.

PBL is guided by a constructivist framework that emphasizes problem solving should occur in the same environment as the problem, the presence of the problem is what starts and guides the learning process and determines how the problem is solved, and knowledge is expanded through group discussion.
and collaboration (Savery & Duffy, 1996). The PBL method of instruction focuses on several of the expected outcomes of undergraduate education—particularly the skills to critically think (Duch et al., 2001). This review article evaluates evidence for whether PBL is an effective instructional method to improve critical thinking in nursing students compared to more traditional forms of education.

**METHOD**

Keywords to guide the literature search were identified through the formulation of a PICO (Population, Intervention, Comparison, and Outcome) question (Melnyk & Fineout-Overholt, 2005) related to critical thinking in nursing students and PBL. The PICO question guiding the evidence search was: “In prelicensure nursing students in the clinical setting (P), does the use of problem-based learning (I) versus the traditional model of clinical nursing education (C) improve critical thinking (O)?”

The literature search included the keywords nursing, problem-based learning, and critical thinking.

To identify all available evidence, any studies using a PBL approach and evaluating critical thinking as an outcome were considered (randomized and nonrandomized controlled trials, and quasi-experimental, qualitative, and descriptive studies). CINAHL, ERIC, PsycInfo, and PubMed databases were searched for pertinent research using PBL to improve critical thinking in nursing students, which yielded 61, 5, 8, and 143 articles, respectively. A systematic review including studies using PBL as an intervention between 1999 and 2006 was found (Yuan, Williams, & Fan, 2008), therefore, only studies using PBL as an intervention, evaluating critical thinking as an outcome, and published after 2006 were considered in addition to the systematic review. A second search for articles from 1999 to 2006 using the keywords from Yuan, Williams, et al. (2008) did not identify any additional studies not included in their review. These parameters revealed an additional four studies: two quasi-experimental studies, an experimental pre- and posttreatment comparative design study, and a descriptive analytic study. One study from the systematic review by Yuan, Williams, et al. (2008) was also included. The findings of these studies are summarized in Table 1.

**RESULTS**

The systematic review and the four studies included in this current review were critically appraised, with key information and notes on relative strengths and weaknesses entered into Table 1.

The first study evaluated, the systematic review of evidence by Yuan, Williams, et al. (2008), suggested that there is a lack of strong evidence to support the assumption that PBL improves critical thinking in nursing students. In this review, articles were identified by searching the CINAHL, Proquest, Cochrane Library, PubMed, Medline, Science Direct, OVID, and Chinese Journal Full-Text databases between 1990 and 2006. Keywords that guided the search were problem-based learning, critical thinking, nursing, and effect. All randomized and nonrandomized controlled trials, uncontrolled quasi-experimental studies, qualitative studies, and descriptive studies were considered if PBL was used as an intervention and critical thinking was evaluated as an outcome. Two reviewers critiqued 296 studies for eligibility (noting strengths and weakness of the studies) and methodological quality.

A total of 10 articles were selected based on the highest level of evidence and the quality of controlled trials. Of the 10 studies retrieved, most were descriptive (n = 6) and there was only one randomized controlled trial. Although most of the studies indicated a positive relationship between using PBL and improved critical thinking, the following conditions were noted that may have limited ability to make strong claims of evidence for efficacy of PBL on critical thinking across studies: the majority of studies involved the use of PBL in only one of many courses, there were several different definitions of critical thinking, and there were several different measures of critical thinking. This inconsistency across studies, coupled with a lack of studies with true experimental designs, suggests that current robust evidence about the effects of PBL on nursing students’ critical thinking is limited.

Yuan, Williams, et al. (2008) concluded that in theory, the use of PBL may promote critical thinking in nursing students; however, the findings of their systematic review did not provide supportive evidence. However, when considering the results of the one randomized controlled trial from this systematic review (Tiwari, Lai, So, & Yuen, 2006), there is an indication of initial valid evidence for effects on critical thinking within the narrow context of a classroom setting for first-year nursing students.

Tiwari et al. (2006) examined the effects of PBL on nursing students’ critical thinking in a randomized controlled trial with first-year nursing students at a university in Hong Kong. Students were randomly assigned to a PBL group (n = 40) or lecture group (n = 39). Participants in the PBL group received course content using PBL as the educational approach, whereas the lecture group received the same course content using lectures as the educational approach. Both groups received either the experimental or control intervention for 28 weeks throughout two semesters. The PBL group participated in tutorials consisting of cases based on real patients that used patient information to trigger group discussions facilitated by the instructor. The lecture group received the majority of class content in an uninterrupted lecture presented by the instructor. Students in the PBL group scored significantly higher on the California Critical Thinking Disposition Inventory than students in the lecture group.

Two quasi-experimental studies and a descriptive analytic study that involved the use of PBL with nursing students (Jones, 2008; Ozturk, Muslu, & Dicle, 2008; Yuan, Kunavikutkul, Klunklin, & Williams, 2008) also indicated a positive relationship between the use of PBL and nursing students’ critical thinking ability. Yuan, Kunavikutkul, et al. (2008) equally and randomly assigned 46 undergraduate nursing students to either an experimental PBL group (n = 23) or lecture control group (n = 23). Students in the PBL group did small-group work with five learning packages for a total of 36 hours (2 hours per week for 18 weeks). Each learning package consisted of a core concept map, learning goals, scenario, and trigger questions. The PBL process involved group clarification, brainstorming, self-directed learning, group discussion, and care planning.

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The control intervention was a lecture approach. Teachers verbally and directly transmitted course content to the students during 36 hours (2 hours per week for 18 weeks). Students passively received, rather than actively searched for, information. Class participation was limited. Using the California Critical Thinking Skills Test as an outcome measure, the PBL students had significantly greater improvement on posttest critical thinking scores than students in the control class lectures.

Jones (2008) also found that students in a PBL intervention group demonstrated a highly significant increase in critical thinking compared with the control group. Students in the PBL group (n = 30) were verbally told about PBL strategies and the objectives of PBL during the third week of a maternal-newborn rotation. A problem was presented based on an actual patient in the clinical setting, and students were given an hour to work on the problem in groups. In addition, students kept reflec-
tive journals of their perceptions. Students in the control group \((n = 30)\) participated in preclinical and postclinical lectures on a specific topic by the clinical preceptor.

Similarly, a descriptive analytic study by Ozturk et al. (2008) that explored the critical thinking dispositions of nursing students found significant results in favor of the PBL group \((n = 52)\) compared to the control group \((n = 95)\). Students in the PBL group worked with peers in small groups to identify learning goals, then engaged in self-study and returned to discuss and apply new learning, whereas students in the control group were offered ready-made information in lecture format with limited incentive to stimulate their thinking processes.

A fifth study by Lyons (2008) did not show any observable difference in critical thinking when PBL was used as an intervention. Students were randomly assigned to control \((n = 27)\) and treatment \((n = 27)\) groups for a National Council Licensure Examination for Registered Nurses (NCLEX-RN®) review course. The control group received the review course information in a lecture format, whereas the treatment group received the same course information via PBL-based learning scenarios. Participants were final-semester nursing students who volun-

![TABLE 1](https://example.com/table1.png)

**TABLE 1** (Continued)

**PBL Intervention Studies Involving Undergraduate Nursing Students**

<table>
<thead>
<tr>
<th>Study</th>
<th>Purpose, Sample, and Setting</th>
<th>Design</th>
<th>Outcome Measures</th>
<th>Findings</th>
<th>Study Strengths and Limitations</th>
</tr>
</thead>
</table>
| Jones (2008)        | Explored the impact of PBL as a pedagogical strategy in clinical setting on development of critical thinking and communication skills in nursing; 60 (12 men and 48 women) nursing students (average age = 25.6, range = 25 to 41); ethnic makeup included Caucasians, African Americans, Hispanics, West Indians, and West Africans; hospital setting in New York | Quasi-experimental, two group pretest-posttest design; participants randomly assigned to experimental (PBL, \(n = 30\)) or control (lecture, \(n = 30\)) group based on the days they were assigned for their clinical rotation; both groups were at same hospital in similar clinical situations | Two nursing care plans graded according to Bloom's taxonomy of the cognitive learning domain; critical thinking was measured at beginning and end of semester | Students in PBL group had significant increase in critical thinking compared with control group; effect sizes for critical thinking based on six levels of Bloom's taxonomy of cognitive learning domain: knowledge = 0.52, comprehension = 0.31, application = 0.36, analysis = 0.07, synthesis = 0.25, and evaluation = 0.11 | Strengths: • Narrow eligibility criteria maintains similarity among participants  
Limitations: • Small to medium effect sizes for critical thinking • Convenience sample • Only involved second-year students in a maternal-newborn course  
Only addressed associate degree nursing students • No follow up on critical thinking scores beyond study • No mention of validity and reliability of measures • Critical thinking was not the only outcome being measured • The one facilitator of the study was not blinded to the intervention |
| Ozturk, Muslu, & Dicle (2008) | Explored critical thinking dispositions of nursing students enrolled in PBL versus traditional program; 147 nursing students; classroom setting in two schools of nursing in Izmir, Turkey | Descriptive analytic; participants enrolled in two schools that used either a traditional approach to learning (control, \(n = 95\)) or a PBL approach (experimental, \(n = 52\)) | CTDI (Turkish version); critical thinking dispositions were measured in middle of final semester of final year | Difference in critical thinking disposition points was statistically significant in favor of the PBL group; effect size for overall score on CTDI postscore = 0.21 | Strengths: • Large sample size • Reliable measurement tool  
Limitations: • Only addressed fourth-semester students • No indication if students in PBL group were in PBL group for entire nursing program and vice versa • No baseline data on critical thinking dispositions; unable to assess change in critical thinking relative to program • No follow up on critical thinking disposition scores after study • Groups not equal in size • Small effect size |
Design Examined effects of 149 Outcome Measures Findings

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...show positive results. As discussed, there may be a number of threats to validity in this one outlier study not present in other studies.

Although sample sizes were small (ranging from 46 to 147 participants), there was similarity among participants within each of the studies, strengthening the ability to draw conclusions about that particular population of students. On the other hand, the level of nursing students in each study sample varied greatly across studies, ranging from beginning to final-semester students, thus limiting the generalizability for any single study (although this may suggest that the potential for finding effects is good across the span of programs). Interventions only lasted for one course (within a single or two semesters), and yet effects were found with this minimal amount of time.

Interestingly, the content and methods of delivering PBL interventions differed among the studies, but all of the interventions involved the PBL components of real-world situations (“problems”), group learning, student-directed solutions of problems, and teacher as facilitator. However, a variety of other techniques were incorporated that included reflective journaling, case scenarios, and care planning. Using a variety of PBL techniques makes it difficult to compare the efficacy of the interventions across studies. Where the interventions took place (classroom and clinical settings) and how the interventions were delivered were not the same, again making it more difficult to combine the findings to make strong statements about...
the effectiveness but providing more support for the generalizability across contexts.

This evidence review also revealed a multitude of tools used to measure critical thinking, ranging from students’ perceptions of a change in critical thinking to standardized tests such as the California Critical Thinking Skills Test. More studies used student perception as a measurement tool, thereby decreasing the validity and reliability of measurement. Two of the studies did not look at improved critical thinking as the sole outcome of PBL. The study conducted by Lyons (2008) measured the effects of PBL on NCLEX-RN examination scores in addition to critical thinking. Similarly, Jones’ (2008) study that measured an additional outcome other than critical thinking had small effect sizes for critical thinking. Finally, a majority of the studies lacked any follow up on critical thinking beyond the intervention. A summary of this review and appraisal of evidence is included in Table 2.

**IMPLICATIONS FOR PRACTICE AND FUTURE RESEARCH**

The findings of this evidence review reveal that there are only a small number of published rigorous studies that establish a clear relationship between PBL and improvement of critical thinking in prelicensure nursing students. Two of these studies suggest that PBL does improve critical thinking within the specific context of a classroom setting for beginning nursing students. One of the studies suggests that PBL improves critical thinking within the context of the clinical setting. Otherwise, the preponderance of studies found a positive relationship. However, the study designs had room for error in interpretation and threats to validity.

These findings bring us one step further along the past conclusions of the systematic review discussed above by Yuan, Williams, et al. (2008) on developing nursing students’ critical thinking through PBL, suggesting that the evidence is growing. However, there is still a need for stronger study designs to establish evidence across contexts, examine critical elements of PBL, determine the length of time needed to show effects, and follow up to find what it takes to maintain the effects.

To broaden the evidence across a number of contexts, further rigorous testing of PBL with prelicensure nursing students in the clinical setting is still required. In future research, it will be especially important to address key limitations of past research identified in this evidence review: clarifying and standardizing the definition of critical thinking in nursing education, using validated measurement tools, examining different lengths of intervention, and continuing to examine outcomes in follow-up assessments after the intervention. A number of studies in this evidence review were small and nonrandomized, and only addressed nursing students in one class or during the course of one semester. In addition, critical thinking was never clearly defined.
as it relates to nursing education. The validity and reliability of the tools used to measure critical thinking also were not addressed in all of the studies.

However, there is evidence available that can guide the teaching practices of clinical nursing instructors. These teaching methods include group discussion, group problem solving based on actual patients in the clinical setting, and student-directed learning. In addition, clinical nursing instructors should acknowledge the changing acute care environment. They should be open to teaching models other than the traditional model of prelicensure nursing education that relies on learning routine tasks and rote memorization of information. Until there is evidence from randomized controlled trials that can confirm PBL improves nursing students’ critical thinking, clinical nursing instructors will continue to follow the traditional model of clinical education. This will not only affect nursing students’ ability to critically think as new graduate nurses, but it will also affect the quality of care they provide to patients.

REFERENCES


