



## A Comparison of Problem-Based and Conventional Curricula in Nursing Education

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**Abstract.** The purpose of this study was to compare graduating baccalaureate students in a problem-based curriculum with those in a conventional nursing program with regard to perceived preparation for clinical practice, clinical functioning, knowledge and satisfaction with their education. Prior to graduation, students completed a self-report questionnaire that consisted of five sections and took about 45 minutes to complete. Following graduation, their pass rates on the National Nursing Registration Examination (RN Exam) were also compared.

The findings indicated no significant differences in their perceived preparation for nursing practice, although the conventional students scored higher in all areas. There were also no significant differences between the two groups in their perceived clinical functioning, although there was a trend toward higher function in the areas of communication and self-directed learning in the PBL group. There were no statistically significant differences in RN scores. The PBL students scored significantly higher on perceptions of their nursing knowledge, particularly in the areas of individual, family and community health assessment, communication, teaching/learning, and the health care system. The students undertaking the PBL program were more satisfied with their educational experience than their counterparts in the conventional program, indicating higher satisfaction with tutors, level of independence, assessment and program outcomes, but no difference in relation to workload or clarity of expectations.

This study contributes to our understanding of the relationship between different educational approaches and student outcomes. It suggests that PBL is an effective approach for educating nurses. Furthermore, it indicates that nursing students in the PBL program, like their counterparts in PBL medical programs, report higher levels of satisfaction. Future studies that are longitudinal in design and rely less on self-report measures would contribute further to our understanding of the benefits and limitations of PBL in nursing education.

**Key words:** curriculum, nursing, preparation for clinical practice, problem-based learning, satisfaction with education

## **Background to the Study**

Nursing practice has been changing, from an emphasis on the value of technical skills and abilities, to one where autonomy and the decision-making components of nursing are assuming greater importance (Bevis and Watson, 1989; Tompkins, 2001). Increased client participation, budget reductions, technological developments and political interventions are all contributing to unprecedented changes in nursing practice. These changes require that nurses have qualities of critical thinking, independence, inquiry and the capability for teamwork (Dieklemann, 1995). Consequently, the challenge is to find methods of educating nurses which facilitate the development of these qualities.

Problem-based, self-directed learning is an educational approach that is believed to facilitate the development of these necessary abilities in nursing graduates, hence the increasing interest by schools of nursing in adopting this approach. While research into the process and outcomes of problem-based learning (PBL) in medical education suggests that it is as effective as conventional approaches in preparing medical practitioners (Albanese and Mitchell, 1993; Busari et al., 1997; Distlehorst and Robbs, 1998; Norman and Schmidt, 1992; Vernon and Blake, 1993), there is no reported evidence of its effectiveness in nursing education. Published reports of PBL use in nursing programs have been mainly descriptive and several have focused on issues of implementation (Amos and White, 1998; Andrews and Jones, 1996; Creedy et al., 1992; Glen, 1994; Heliker, 1994; Little and Ryan, 1989; Ryan and Little, 1991; Townsend, 1990). Other authors have explored the PBL process (Duke et al., 1998; McMillan and Dwyer, 1989), while some have studied student satisfaction with PBL (Frost, 1996; Rideout, 1998; White et al., 1999). Consequently, there is a need to explore the benefits and limitations of PBL within nursing education. Therefore the purpose of this study was to compare the graduating students from a problem-based (PBL) curriculum with those from a more conventional nursing program. The following research question was addressed:

Is there a difference in the preparation for clinical practice, perceptions of clinical functioning, nursing knowledge base and level of satisfaction with educational program between graduating nursing students from a PBL program and those from a conventional program?

## **Literature Review**

Much of the research into the uses and effectiveness of PBL has involved medical programs, and the studies have explored such areas as clinical decision-making and clinical practice, knowledge acquisition, and student satisfaction with their learning environments. Three meta-analyses published in 1993, supplemented by the most recent literature, provide comparative information about the PBL outcomes of clinical decision making, preparation for clinical practice and knowledge.

*Clinical decision-making and clinical practice.* Albanese and Mitchell (1993) reviewed seven studies that compared the clinical ratings by faculty supervisors of medical school graduates from PBL programs compared to those from conventional curricula. In all the studies, “ratings by faculty were either more positive for learners in the PBL curriculum or non-significantly different from the ratings of the conventional group” (p. 65). Vernon and Blake (1993) also analysed studies that compared clinical performance on one or more measures, most often observations of behaviour with real or simulated patients. They reached a similar conclusion to that of Albanese and Mitchell, namely, that PBL learners exhibited better clinical performance than did learners from conventional programmes.

A recent study compared perceptions of medical education among students and graduates from three Dutch medical schools, one of which was a PBL school and the others conventional (Busari et al., 1997). Participants completed self-assessments of their psychosocial, interpersonal and clinical patient management skills. Those from the PBL program reported higher satisfaction with their training and better preparation in psychosocial and interpersonal skills. However, they reported no difference, compared to those from conventional schools, in their ability to manage clinical situations.

*Knowledge acquisition.* Albanese and Mitchell (1993) examined studies that compared the academic performance of learners in PBL and conventional curricula on specific standardized tests (e.g., the National Board of Medical Examiners Parts 1 and 11, an examination taken by all medical learners in the USA), and concluded that, “While the expectation that PBL learners will not do as well as conventional learners on basic science tests appears to be generally true, it is not always true” (p. 57). Vernon and Blake (1993) also used data from studies of student performance on similar standardized tests and determined there was a significant trend favouring conventional teaching methods. Berkson (1993) compared academic achievement of conventional and PBL medical learners by examining studies that had used a wide array of measures of knowledge acquisition and concluded that “no one has been able to demonstrate an important advantage of one curriculum over the other” (p. S80).

Newman (1995) compared the knowledge of nursing students enrolled in PBL with that of students in a non-PBL approach in one course within a conventional baccalaureate curriculum. Scores on the final examination, which consisted of multiple choice and short answer questions, were slightly but non-significantly higher for the non-PBL approach on the multiple choice questions, while PBL learners scored slightly higher on the short answer questions. Again, the differences were not statistically significant. Newman concluded that one curriculum approach could not be favoured over the other. However, these results should be viewed conservatively since they are based on only one course within a total four-year nursing program. In another study, Solomon et al. (1996) compared the performance of physiotherapy learners from an integrated PBL program with those

from a program that had introduced PBL into some senior courses within an otherwise conventional curriculum. The PBL learners attained slightly higher scores on a multiple choice examination that included basic science and clinical science questions, although the difference was not statistically significant.

In a more recent study, Kaufman and Mann (1999) compared performance of medical students from a PBL curriculum with those from a conventional curriculum on a number of tests of knowledge achievement at three time intervals. They concluded that the performance upon completion of medical school, and at the other two time points, was equivalent in the two groups.

Taken together, the evidence concerning academic achievement is slightly in favour of non-PBL programmes when the course outcomes are measured using conventional fixed choice examinations, although the most recent research does not suggest there is any significant difference.

*Student satisfaction with learning environment.* Many of the quantitative studies that explored student satisfaction with their learning environments compared the perceptions of medical students in a PBL curriculum with those enrolled in an existing conventional approach being offered within the same university using measures such as the Medical School Learning Environment Survey (Bernstein et al., 1995; Clarke et al., 1984; Kaufman and Mann, 1997; Moore-West et al., 1989). In each of these studies the PBL students perceived their learning environments to be more positive than their counterparts in conventional programs. Other studies employed qualitative methods of data collection and were conducted with medical students (Davis, 1995), nursing students (Ishida, 1995; Khoiny, 1995; Rideout, 1998), physiotherapy students (Solomon and Finch, 1998), and occupational therapy students (Stern, 1995). Again the results indicate that the PBL approach is viewed positively by learners, who describe it as enjoyable, interactive, relevant, practical and holistic. Limitations of the method were also noted, including a lack of confirmation that essential content was being learned, a belief that group process issues sometimes interfered with learning, and the sense that tutors sometimes differed in their expectations of learners. Generally the areas of concern or issues for improvement were few, leaving the impression that PBL is viewed in a uniformly positive way by participants.

In summary, research continues to be generated on the benefits and limitations of PBL compared to conventional curricula. To date the studies have almost unanimously used medical learners from diverse programs, and some conclusions can be drawn. First, learners from PBL curricula tend to be rated somewhat better in regards to interpersonal communication and clinical performance. Second, there is a trend to a somewhat better performance on standard examinations by learners from conventional curricula compared to those from PBL programs. Third, there is a fairly consistent finding that PBL students report a higher level of satisfaction and enjoyment with their program than do learners from conventional curricula. This

literature review has also highlighted the dearth of research into the effectiveness of PBL within nursing curricula.

### **Setting for the Study**

McMaster University School of Nursing and the University of Ottawa School of Nursing provide four-year generic baccalaureate nursing programs. The goal of both programs is to provide education for the preparation of professional nurses for entry level practice in a variety of health care settings. Nursing at McMaster is based on an andragogical educational philosophy within which small-group tutorials, problem-based learning and self-directed learning are used as the principal teaching learning modalities. The role of faculty is to guide and support student learning using such skills as questioning, coaching and mentoring. All nursing theory and practice courses use the problem-based approach, and students meet and work together in groups of 8–10. The students select their own clinical placements in the third and fourth years of the program.

At the University of Ottawa School of Nursing, the student is also seen as an adult learner capable of self-direction. The faculty facilitate the acquisition of professional knowledge, skills and attitudes through formal lectures, selected clinical experiences and extensive interactions between the students and teachers. The final semester of the program involves a consolidation period of practice in an area of the students' own choice.

### **Methodology**

A cross-sectional analytical design using a self-report questionnaire composed of several instruments was employed to compare the graduating students of the two educational programs, and to ascertain the similarities and differences among them.

All students who were completing their nursing program in April 1999 were invited to participate. In the PBL program, the questionnaire was distributed within a small group tutorial during the second to last week of the final term. Students either completed the questionnaire during tutorial time or at home with instructions to complete and return it. In the conventional program, the questionnaire was distributed and completed in a large class two weeks prior to the end of the program. The questionnaire took approximately forty-five minutes to complete.

### **Instruments**

*Admissions and demographic data.* Data related to age, gender, marital status and Percent Average on Admission to the respective programs comprised the demographic data used to assess the comparability of the two study groups.

*Clinical functioning.* Student perceptions of their clinical functioning ability was assessed using a modified version of the Clinical Functioning Questionnaire that was employed in follow-up studies of BScN graduates conducted by Crook and Feldman (1981) and Ingram et al. (1994). Respondents were asked to rate their clinical functioning abilities using a six point Likert scale anchored by 1 (not satisfied) to 6 (very satisfied) in four areas: *clinical decision-making*, a 15 item sub-scale that included assessment skills, nursing care planning, establishing priorities, performing procedures safely, accountability and documenting; *collaborative relationships*, which included 7 items related to the ability to initiate discussions and work cooperatively with colleagues; *self-directed activity*, a 5 item sub-scale that addressed problem-solving, seeking and responding to constructive feedback, and seeking help when in doubt; and *communication*, which had 5 items that assessed the perceived ability to communicate effectively with patients, families and colleagues. Face and content validity of the clinical functioning questionnaire were established through a review of the expected competencies of beginning nursing practitioners (College of Nurses of Ontario, 1998) and through pretesting the instrument with representatives of groups of respondents. Possible total scores on this measure ranged from 32–192, with higher scores indicating better clinical functioning.

*Preparation for clinical practice.* Students were asked to indicate their satisfaction with their entry level preparation for practice on a 6 point scale, from 1 (not satisfied) to 6 (very satisfied) in 7 separate areas of nursing practice: adult medicine, adult surgery, pediatrics, geriatrics, mental health, community health and maternal-child.

*Nursing knowledge base.* The knowledge base of students was measured in two ways. First, a 33-item scale designed for this study explored student perceptions of their attainment of the knowledge and skill in the major concepts and practice areas of nursing in the two curricula. Respondents were asked to indicate their opportunity to learn, using a 6-point scale anchored by 1 (no opportunity) to 6 (very good opportunity) in the following content areas: *nursing* (e.g., community assessment, health promotion, physical assessment, technical skills); *communication* (e.g., theories, techniques and documentation); *teaching and learning* (e.g., teaching and learning theory, group theory, self-appraisal); *theoretical knowledge* (e.g., growth and development, anatomy and physiology, chemistry, pathophysiology, family, coping, change theories); *professional knowledge* (e.g., standards of practice, leadership, research methods) and *health care system* (e.g., policy development, health care trends, models of health care delivery). The possible range of total scores on this instrument was 33–198, with higher scores indicating higher perceived knowledge levels.

Secondly, performance was compared on the National Registered Nurse Examination (RN Exam), which uses multiple choice questions, covers the entire

domain of nursing, is competency based, and results in a Pass or Fail. A Pass is required to practice as a Registered Nurse in any of the ten provinces of Canada.

*Student satisfaction.* The level of satisfaction with the nursing program was assessed using the 38-item Course Experience Questionnaire, developed to measure student perceptions of their educational program, including faculty behaviors (Entwistle and Ramsden, 1983; Ramsden, personal communication, 1994). Responses to the five-point scale are anchored by 1 (definitely disagree) to 5 (definitely agree), with higher scores indicating higher satisfaction. Factor analysis of the Course Experience Questionnaire, conducted during a previous study of nursing student perceptions of PBL (Rideout, 1998), revealed six sub-scales: clarity of expectations; level of workload; student assessment; quality of tutors; level of independence; and outcomes of the program. Reliability values of 0.80 or greater for each sub-scale, and 0.88 for the entire scale, were noted. The scale has both face and content validity, with no other forms of validity reported. Students were also asked, as part of this instrument, to list three things they liked best, and least, about their program.

### **Analyses**

Statistical analysis was performed using SPSS for Windows-Version 9.0. Independent *t*-tests were performed to compare the PBL and conventional groups on each of the measures. Results were considered statistically significant if *p*-values were less than 0.01. This conservative level was chosen because of the number of variables and therefore the number of *t*-tests conducted. Qualitative responses to the open-ended questions in the Course Experience Questionnaire were analysed for themes by two members of the research team.

### **Results**

Of the 75 BScN students of the PBL program, 45 completed the questionnaires (60%) while at the conventional program 31 of 52 students participated (60%). The admission, sessional and cumulative averages of non-participants in the PBL and conventional programs were compared with those of the participants to determine if any differences existed. *T*-tests revealed no significant differences (Table I).

### **Demographic Data**

Analysis of the demographic data revealed that participating students from the two programs were similar in most respects. They were primarily female, 23 to 24 years of age, had entered their BScN programs after completing high school and had never been married (84.4% of the PBL group and 87.1% of the conventional group). A substantially higher percentage of the PBL students reported

Table I. Comparison of participants' and non-participants' admission, sessional, and cumulative averages

Averages	N	Mean	sd	df = 74
<b>PBL Program</b>				
Admission	P = 34*	82.77	3.65	$t = 0.42$
Averages	NP = 19	83.22	6.05	$p = 0.68$
Sessional	P = 44	9.28	1.31	$t = 0.31$
Averages	NP = 34	9.17	1.89	$p = 0.76$
Cumulative	P = 45	8.46	1.14	$t = 0.07$
Averages	NP = 34	8.48	1.29	$p = 0.95$
<b>Conventional Program</b>				
Admission	P = 24*	75.13	15.83	$t = 0.64$
Averages	NP = 16*	77.06	5.41	$p = 0.47$
Sessional	P = 29	8.79	0.88	$t = 0.39$
Averages	NP = 21	8.16	1.01	$p = 0.70$
Cumulative	P = 29	8.16	1.15	$t = 0.83$
Averages	NP = 22	8.09	1.19	$p = 0.22$

\*The number of participants and non-participants reflects the admission criteria, wherein students with previous university work are admitted to their respective BScN programs based on admission criteria other than high school grades.  
 $p < 0.01$ , P = Participants, NP = Non-Participants.

having some university education credits prior to their BScN program, whereas a slightly higher percentage of the conventional group reported entering their BScN programs with completed baccalaureates in other fields.

When the mean admission averages of the two groups of participants were compared, the admission average for the PBL students ( $\bar{x} = 82.77$ , SD 3.65) was found to be significantly different from that of the conventional students ( $\bar{x} = 75.13$ , SD 15.83;  $p = 0.01$ ). Analysis of covariance (ANCOVA) was performed with all other outcome measures to determine whether the significant difference in admission average was a factor in the findings in all other analyses. It was concluded that it was an independent finding, and the differences found between the two groups were due to the program rather than the admission average.

### Clinical Functioning

There were no statistically significant differences in the perceived abilities of students of the PBL and conventional programs in clinical decision-making, collaboration, communication and self-directed activity, although there was a trend toward a greater sense of preparedness for clinical functioning by the PBL group in the latter two areas (Table II).



Table II. Perceived ability in clinical functioning

Clinical functioning questionnaire	PBL (N = 45)		Conventional (N = 31)		df = 74
	Mean	sd	Mean	sd	
Clinical decision-making (range 15–90)	72.07	8.55	69.31	8.89	$t = 1.36; p = 0.20$
Collaborative relationships (range 7–42)	32.09	6.03	30.13	5.00	$t = 1.49; p = 0.14$
Communication (range 5–30)	26.62	2.45	25.06	3.38	$t = 2.33; p = 0.02$
Self-directed learning (range 5–30)	26.00	3.27	24.1	3.27	$t = 2.49; p = 0.02$

Table III. Perceived ability in clinical functioning

Preparation for clinical practice by clinical area	PBL (N = 45)		Conventional (N = 31)		df = 74
	Mean	sd	Mean	sd	
Adult medicine	4.18	1.23	4.45	0.89	$t = -1.06; p = 0.29$
Adult surgery	4.13	1.22	4.39	0.99	$t = -0.96; p = 0.34$
Pediatrics	3.22	1.73	3.58	0.99	$t = -1.14; p = 0.26$
Geriatrics	4.11	1.57	4.45	1.06	$t = -1.13; p = 0.26$
Mental health	3.6	1.71	4.26	1.06	$t = -2.07; p = 0.04$
Community health	3.78	1.46	4.13	1.02	$t = -1.16; p = 0.25$
Maternal child	4.13	1.36	4.32	1.19	$t = -0.63; p = 0.53$

### Preparation for Clinical Practice

There were no statistically significant differences in preparation for clinical practice in the seven defined areas of practice, although participants from the conventional program had a higher mean score in each of the areas (Table III).

### Nursing Knowledge

*Knowledge and skill for practice.* There was a significant difference in the perceptions of the PBL compared to the conventional participants regarding their level of knowledge and skill for clinical practice in the following areas: nursing knowledge, communication, teaching/learning, and healthcare system, while theoretical knowledge approached significance (Table IV).

*National Registered Nurse Examination.* The results of the National Registered Nurse Examination (RN Exam) are reported as Pass/Fail. Of the 75 PBL students who wrote the exam, 70 passed (93%) while 51 of 52 of the conventional students were successful (98%). This difference was not statistically significant (Fisher's

Table IV. Opportunity to develop knowledge and skills for clinical practice

Knowledge and skill for clinical practice	PBL (N = 45)		Conventional (N = 31)		df = 74
	Mean	sd	Mean	sd	
Nursing (range 6–35)	26.64	3.39	23.29	3.00	$t = 4.44; p = 0.00^*$
Communication (range 4–24)	19.13	2.78	16.55	3.36	$t = 3.66; p = 0.00^*$
Teaching/learning (range 5–30)	27.36	2.19	20.03	3.58	$t = 11.1; p = 0.00^*$
Theoretical knowledge (range 8–48)	36.23	5.41	33.23	5.61	$t = 2.34; p = 0.02$
Professional knowledge (range 5–30)	22.36	3.72	20.97	4.10	$t = 1.53; p = 0.13$
Health care system (range 5–30)	21.31	3.79	18.71	4.32	$t = 2.78; p = 0.01^*$

\* $p < 0.01$ .

Exact Test 1.53;  $p = 0.21$ ). To determine the RN Exam results of the individual participants of this study required that they give written permission to the university. Of the 45 PBL students who participated in this study, 38 (84%) gave permission, while permission was given by 20 of the 31 participating conventional program students (65%). Thirty-six of the 38 PBL students passed the exam (94.45%) while 19 of 20 students from the conventional program were successful (94.74%).

### Student Satisfaction

A comparison of the PBL and conventional program responses on the Course Experience Questionnaire revealed that PBL students were more satisfied with their educational program than those from the conventional program in all but two areas (Table V). There were statistically significant differences between the two groups on scores for role of the tutor, program outcomes, student assessment, level of independence and overall satisfaction, with the PBL program receiving higher ratings in each of these areas. There were no significant differences between the groups on the items related to workload and clarity of expectations.

Qualitative responses to the open-ended question on the Course Experience Questionnaire “Name three things you like best about your BScN program,” shed further light on the quantitative responses. Two themes emerged strongly in data from the PBL group. One theme focused on the independence/self-direction that is a hallmark of the program. There were repeated comments supporting “the autonomy given to students”; “the self-directed philosophy”; and “the ability to choose, develop one’s own learning plans and ‘go with an idea’.” One student stated, “It allowed me to study in the way that best met my needs.” The second theme related to positive perceptions of faculty. Students repeatedly commented on the “low student-tutor ratios,” “helpful, flexible faculty,” and “the close tutor-student relationships that develop in small groups.”

Table V. Student satisfaction (course experience questionnaire)

Student satisfaction sub-scales	PBL (N = 45)		Conventional (N = 31)		df = 74
	Mean	sd	Mean	sd	
Role of tutors (range 8–40)	30.76	4.24	19.45	4.29	$t = 11.36; p = 0.00^*$
Clarity of expectation (range 7–35)	22.67	4.50	20.19	4.53	$t = 2.35; p = 0.02$
Outcomes of program (range 6–30)	25.64	2.64	23.32	2.82	$t = 3.67; p = 0.00^*$
Student assessment (range 6–30)	23.27	3.09	17.55	2.94	$t = 8.01; p = 0.00^*$
Level of independence (range 5–25)	19.04	3.42	11.48	3.22	$t = 9.70; p = 0.00^*$
Workload in program (range 5–30)	15.00	2.57	13.71	3.18	$t = 1.95; p = 0.06$
Overall satisfaction (range 37–175)	136.38	13.74	105.70	13.02	$t = 9.77; p = 0.00^*$

\* $p < 0.01$ .

Feedback from the conventional program was quite varied, although the variety and amount of clinical practice opportunities were noted by a number of students as a positive feature. Other comments ranged from “relationships with other classmates” to “professionalism, problem-solving and how to deal with people”; “modern technology in teaching”, “high quality, varied placements” and the “broad scope of course content”. Students were also asked to comment on three areas that they liked least about their BScN program. The PBL students’ major issues with their program related to a perceived lack of preparation in certain content areas, specifically pathophysiology, pharmacology and technical nursing skills. Other frequent comments related to assessment and a lack of clarity and direction regarding assignments, concerns about faculty inconsistencies, and the repetitive, often positively-skewed, peer evaluations that are a part of the small group PBL format.

Comments from the conventional program reflected some of the same themes of the PBL program although there was more variation in these students’ concerns. They spoke of inconsistencies in marking and lack of feedback on assignments, unclear expectations and lack of pharmacology content. There were also concerns about the focus on acute and tertiary care as compared to community nursing, the organization of courses, and problematic relationships with some faculty and support staff.

## Discussion

This study has confirmed many of the findings from the medical education research comparing PBL and conventional programs. First of all, the graduating students from the PBL program indicated they were as well prepared for clinical practice as their conventional counterparts. Their perceived preparation for clinical practice in the seven settings in which nurses commonly practice did not differ significantly

from those in the conventional program. This was noted even though the PBL group did not have experience in all areas within their nursing education, unlike the conventional students who spend some time in each practice setting. This may reflect a sense of confidence that PBL students have in their ability to function in situations they have not yet encountered, based in large part on their capacity to identify their learning needs and access appropriate resources. This is one intended outcome of the PBL approach to education, and there is evidence that this outcome is both achieved and valued by PBL students (Lunyk-Child et al., 2001; Rideout, 1998).

With regards to knowledge acquisition, there were significant differences in students' perceptions of the opportunity they had to develop the various knowledge and skills required to begin their nursing careers. The PBL students rated themselves higher in the areas of communication and teaching and learning. This is similar to findings from studies with medical students who also perceived communication and interpersonal knowledge and skills as areas of strength (Busari et al., 1997). The PBL students also differed from the conventional students in their perceived knowledge of the health care system, which included areas such as models of health care delivery, health care trends and policy development. This content is integrated in the various scenarios explored within the PBL program and so may be encountered several times in varying levels of complexity. There were no significant differences between the groups in a number of other areas of theoretical knowledge such as pathophysiology and family theory, and professional knowledge related to leadership and standards of practice.

The knowledge outcome of particular interest to nurse educators who are considering a change to a PBL curriculum is the pass rate on the RN Exams, a national examination that tests the whole domain of nursing knowledge. Successful completion of the exam is required to practice as a registered nurse. There were no statistically significant differences between the two groups, although a higher percentage of the conventional group achieved a Pass. This finding is congruent with the findings of the meta-analyses of Albanese and Mitchell (1993) and Vernon and Blake (1993), who also found a slight trend for conventional medical school students to perform somewhat better on licensing examinations for medical practice.

The PBL students in this study expressed significantly greater levels of satisfaction with their educational experience than their conventional program counterparts, and this is certainly congruent with the many reports of high levels of satisfaction with PBL among medical students (Bernstein et al., 1995; Busari et al., 1997; Kaufman and Mann, 1997). Satisfaction was particularly evident in relation to the level of independence afforded them in the PBL program, the relationships with faculty that were described as supportive and positive, and the outcomes achieved, particularly the ability to problem-solve and communicate with others.

### Limitations of the Study

There are limitations to this study that must be acknowledged. First and perhaps most important is the reliance on measures of self-report. The perceptions of the students may not reflect the reality of their knowledge base and clinical functioning ability. It is possible that the PBL students express higher levels of confidence and are more positive about their knowledge and abilities than their conventional counterparts, at least partially because of their high level of satisfaction with their program and their feelings of support from tutors. It is important that a follow-up study be conducted to determine if the perceived differences are also evident in their nursing practice following graduation.

A second potential limitation was the significant difference in admission average of the two groups. However, analysis of co-variance (ANCOVA) was conducted and all significant differences between the groups were found to be due to the program rather than the average, suggesting that the difference in admission average posed no significant bias. A third possible concern was the response rate of 60% at both sites. Although we were able to compare participants and non-participants within sites on their academic performance and found no differences, perhaps the groups differed in other ways that we were unable to measure.

### Conclusion

Overall, our results indicate that the perceived confidence of the PBL students in their knowledge for clinical practice was greater than that of their counterparts educated within a conventional curriculum. This is supported by their similar pass rates on the RN examinations. Students of the PBL program expressed high levels of satisfaction, and indicated valuing the educational method. Since this study was conducted, the conventional program has undergone a curriculum review and many of the features of PBL have been introduced into the program. A replication of this study and a follow-up of students to determine their career patterns and nursing practice abilities would further add to our understanding of the strengths and limitations of the PBL method that is dominating medical programs around the world and is becoming more widespread within nursing education.

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