

## Moving from a lecture-based to a problem-based learning curriculum- perceptions of preparedness for practice

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### Abstract

**Objectives:** A comprehensive evaluation plan was designed to investigate the effect of curricular change from a lecture-based to a problem-based learning (PBL) curriculum. The objective of this paper is to describe the results of three surveys that examined perceptions of preparation for practice by three stakeholder groups.

**Method:** Three survey instruments were designed to obtain opinions regarding preparation for practice from graduating students, preceptors and supervisors/employers from three curricula that were in place as the PBL curriculum was being implemented.

**Results:** The students graduating from the PBL curriculum perceived themselves to be equally or better prepared than did the students graduating from the other two curricula in a number of activities/competencies. Results from the preceptors and supervisors/employers did not identify any significant differences among the curricula.

**Conclusions:** The survey results provide some data suggesting that the outcomes-based, integrated, hybrid PBL curriculum prepares students for practice as well as, or better, in a number of areas than the lecture-based curriculum.

**Keywords:** *Assessment, evaluation, problem-based learning, surveys*

### Introduction

In 1997, the Dalhousie University College of Pharmacy implemented the first outcomes-based, integrated, hybrid problem-based learning (PBL) curriculum in an undergraduate pharmacy program in Canada. A complete description of this innovative pharmacy curriculum has been published previously (Whelan, Mansour, & Farmer, 2002). A comprehensive curriculum evaluation plan (Appendix A) was developed to monitor the goals and objectives of the program in accordance with the standards set by the Canadian Council for Accreditation of Pharmacy Programs. This included evaluating the achievement of the activities/competencies required at the point of graduation from the College of Pharmacy as identified in *The expected curricular outcomes of the Dalhousie College of Pharmacy*, and then later in *The AFPC Educational Outcomes for a Baccalaureate Pharmacy Graduate in Canada* (Revised Educational Outcomes, 1998).

There were six major categories; each of which had various elements for a total of 50 activities/competencies. When developing the comprehensive curriculum evaluation plan it was important to ensure that the College was: (1) obtaining regular feedback from the students; (2) assessing the degree to which students acquired knowledge and skills; (3) assessing the ability of the students to apply their learning to the work site and (4) monitoring the overall performance of students after graduation (Kirkpatrick, 1996).

During the several years it took to implement the new curriculum, students graduated from three different curricula: lecture-based, transitional and problem-based. One part of the evaluation plan was to examine how well the PBL curriculum prepared Dalhousie University pharmacy graduates for practice as compared to the lecture-based curriculum. We anticipated that graduates would be equally or better prepared in some areas with the introduction of the PBL curriculum. One way we chose to assess this part

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of our curricular change was by means of graduating student, preceptor and employer surveys. Such surveys have been described in the assessment of other curricula.

An example of a professional pharmacy outcomes assessment plan has been proposed for the University of Nebraska College of Pharmacy, incorporating student self-assessment surveys as well as alumni/preceptor/employer surveys (Scott, Robinson, Augustine, Roche, & Ueda, 2002). The assessment of curricular competency outcomes, using a faculty questionnaire to monitor curriculum content and a student instrument to ascertain student perceptions of personal progress, has been described (Kirkpatrick & Pugh, 2001). Holdford and Reinders (2001) assessed perceptions among pharmacy students in their final year of both the process of education and perceived educational progress. Students' perceptions, as they progressed through their Doctor of Pharmacy curriculum, of their preparation to provide pharmaceutical care were examined using a survey method (Ried, Brazeau, Kimberlin, Meldrum, & McKenzie, 2002). A survey of pharmacy externs, to evaluate their competence and confidence at the end of their externships, identified weakness in communication skills and therapeutic knowledge, and the results were used to guide curriculum revision (Parish, Morton, Francisco, & McCombs, 1993). More recently a study compared student and preceptor perception of knowledge and skills in advanced pharmacy practice using a survey instrument (Hill & Kirkwood, 2005). The preparedness of medical interns for hospital practice was assessed using a 41-item questionnaire measuring eight subscales relating to medical hospital-based work (Hill, Rolfe, Pearson, & Heathcote, 1998). Using interviews and questionnaires, Guilbert (1998) compared the opinions of students and teachers concerning medical education programs in Switzerland. Physicians' perspectives of their medical education several years after graduation have been surveyed by an instrument asking them to rate given aspects of their curriculum as either strengths or weaknesses (Woodward & Ferrier, 1982). The same authors also asked physicians to evaluate their preparation for postgraduate training (Woodward & Ferrier, 1983). Surveys of practicing residency-trained family physicians have been used to assess practitioners' perspectives on surgical and pediatric training programs (Reznick, Brewer, Wesley, Spencer, & Folse, 1988; Macnab, Martin, Duffy, & Murray, 1998).

While a call has been issued for development and use of meaningful surveys of alumni and their employers as a means of improving educational institutions, relatively few studies were found that specifically involve curricular assessment by supervisors and employers of pharmacy graduates (Hoey & Gardner, 1999). A University of Kansas survey

assessing graduate outcomes, with a focus on professional and community activities, included alumni evaluation of the School's contribution toward the development of skills in problem solving, communication, independent self-learning and adaptation to change (Howard, Henry, & Fincham, 1998). One study surveyed medical students about to graduate, directors of medical residency programs and physician employers, in an effort to compare perceptions, skills, competencies and attitudes either perceived or sought in graduates (Villanueva, Kaye, Abdelhak, & Morahan, 1995). Interestingly, accreditation standards require counsellor education programs to conduct separate follow-up surveys of graduates and of employers (Sayers, Carroll, & Loesch, 1996).

Measures used to help determine the effectiveness of the Dalhousie University pharmacy curriculum included monitoring student performance (via course examinations, internal progress examinations and the results of the Pharmacy Examining Board of Canada national examinations), perceptions of student preparation for practice (via surveys administered to graduating students and to supervisors/employers of recent graduates) and perceptions of student preparation for final year practice experience programs (PEP) (via surveys administered to preceptors of graduating students). The objective of this paper is to describe the results of the three surveys used to evaluate the three curricula; lecture-based (Class of 1998); transitional (Classes of 1999 and 2000); and PBL (Classes of 2001 and 2002). The results presented focus on the various perspectives of the graduating students' preparation for practice in terms of knowledge and skills.

## Materials and methods

The primary objectives and methods for the three surveys examining graduating students' preparedness for practice from the three curricula are described separately below.

### *Educational experience and preparation for practice: A survey of graduating pharmacy students*

*Objective* Our primary objective was to determine if there was any difference in perceived preparedness for practice between students graduating from the lecture-based curriculum, those graduating in the 2 years of transition between the two curricula, and those in the PBL curriculum.

*Methods* A 24-item questionnaire was developed covering the four main areas of: (1) demographics; (2) College of Pharmacy experience; (3) pharmacy practice experience and (4) educational preparation.

The questionnaire was piloted in a group of graduating students and a group of recent graduates. Based on their feedback, changes were made to improve the composition and content of the questionnaire. A cover letter explained the purpose of the questionnaire, as well as its voluntary and anonymous nature. No identifier was attached to the questionnaire. Participants were advised that their answers would be entered into a database, and were assured that only collated, anonymous results would be reported. The questionnaire was administered to graduating students (in the Classes of 1998–2002) during a dedicated class time just prior to graduation.

Data were analysed using Statistical Analysis Software. One way analysis of variance with  $F$  value at  $\alpha = 0.05$  and Bonferroni  $t$ -test for multiple comparisons at 0.05 level were performed to determine statistical significance. Ethical approval for this project was obtained from the Faculty of Health Professions Ethics Committee in 1998.

*Preparation for practice: A survey of supervisors/employers of pharmacy graduates*

**Objective** Our primary objective for this project was to identify supervisors'/employers' opinions on the level of preparedness of graduates from the lecture-based curriculum, transitional curriculum and PBL curriculum in their first job following graduation.

**Methods** An 18-item questionnaire was developed, requesting information on: (1) demographics; (2) educational preparation and (3) personal skills. It was piloted on a group of supervisors/employers and modifications were made based on their feedback. A cover letter explained the objectives of the project as well as its anonymous and confidential nature. Participants were assured that only collated responses would be reported. The cover letter and questionnaire were mailed to supervisors/employers of graduates of the Classes of 1998–2002 one to two years after graduation. The questionnaire was sent out to three groups: to the supervisors/employers of the Class of 1998 (lecture-based curriculum), supervisors/employers of the Classes of 1999 and 2000 (transitional curriculum) and to the supervisors/employers of the Classes of 2001 and 2002 (the PBL curriculum). No identifier was attached to the questionnaire. Participants were asked to sign an informed consent form to be returned in the same numbered, self-addressed stamped envelope as the questionnaire. A reminder was sent 3 weeks after the initial mailing to nonresponders.

Due to the low response rate from supervisors/employers, data obtained for this project were not analysed statistically for difference. Only descriptive statistics were applied. Ethical approval for this project

was obtained from the Faculty of Health Professions Ethics Committee in 1999.

*Preparation for final year practice experience program: A survey of pharmacy preceptors*

**Objective** The primary objectives of this project were to gather opinions on how prepared final year students were for clinical performance and professional practice, and to determine if any differences existed in the preparation for clinical practice between students of the transitional and the PBL curricula. Due to time constraints we were unable to initiate this project in time to collect data from the preceptors of students in the lecture-based curriculum.

**Methods** A 35-item questionnaire was developed covering: (1) clinical performance of the student; (2) professional characteristics of the students; (3) overall preparation of the student for final year PEP and (4) preceptor demographics. Development of the questionnaire, as well as the process for distribution was similar to the supervisor/employer survey.

The questionnaire with the cover letter and informed consent was mailed approximately 6 months after the students' graduation to those preceptors who had supervised students in the final year PEP during 2000–2002. Targeting the same preceptors was intended to allow for a better comparison of graduates from the PBL and transitional curricula in that the preceptors would have supervised students in both programs. Preceptors were instructed to respond to the questionnaire with regard to the student whom they had most recently supervised. If they recently supervised two or more students during the same final year PEP, they were to generalize the responses and complete only one questionnaire. In the event that two or more preceptors supervised the same student, only one preceptor completed the questionnaire. This was the preceptor who could best describe how well prepared the student was for the final year PEP.

Data were analysed using Minitab Statistical Software. Independent  $t$ -test at  $p < 0.05$  was performed to determine statistical significance. Ethical approval for this project was obtained from the Dalhousie University Health Sciences Human Research Ethics Board in 2000.

## Results

*Educational experience and preparation for practice: A survey of graduating pharmacy students*

The response rates from students from all three curricula were similar, ranging from 81 to 86%

(Table I). Just prior to graduation, students were asked how well prepared (from 1 = very well prepared to 5 = very poorly prepared) they perceived themselves to be in order to confidently perform the 50 activities/competencies of practice that comprise *The expected curricular outcomes of the Dalhousie College of Pharmacy*. The perception of students graduating from the PBL curriculum of their preparation was significantly higher than that of the students graduating from both the lecture-based and transitional curricula in 17 activities/competencies (Table II; Part A). The self-perceived level of confidence of students graduating from the PBL curriculum in their preparation was significantly higher than that of the students graduating from the transitional curriculum in 21 additional activities/competencies (Table II; Part B). There were no statistically significant differences among the three curricula in perceived preparedness for practice in 11 activities/competencies. In no activities/competencies was the perceived preparation of students graduating from the PBL curriculum significantly less than that of students graduating from either the lecture-based or transitional curriculum.

In general, the perception of preparation of students graduating from the PBL curriculum was higher than the perception of those graduating from the lecture-based and transitional curricula for all four of the activities/competencies related to *continuously improve professional competence through a commitment to life-long learning* (Table II; Category 4 in Part A) and seven of the 12 activities/competencies related to *skills, abilities and values* (Table II; Category 6 in Part A).

All students graduating from all three curricula perceived themselves to be “well prepared” to “very well prepared” for almost all the activities/competencies. The four activities/competencies for which all students graduating from all three curricula perceived themselves to be the most prepared are 1.4.2–1.4.4 under *meeting clients medication related and health needs* and 6.8 under *skills, abilities and values* (Table III). The eight activities/competencies which all students graduating from all three curricula perceived themselves to be least prepared are 2.1, 2.4, 2.7–2.9 under *contribute to decision making regarding safe, effective and efficient use of drugs*, and 3.3, 3.7 and 3.8 under *manage the business and practice environment of pharmacy* (Table III).

Students were asked how well they felt the pharmacy program had prepared them overall for practice (from 1 = very well prepared to 5 = very poorly prepared). The perceptions of overall preparation for practice among students graduating from the lecture-based and PBL curricula were significantly higher than those of students graduating from the transitional curriculum (Table IV).

Students were also asked to rate how important (from 1 = very important to 3 = not important) various learning components from their educational experience were in developing their competence as a pharmacist. Students graduating from the PBL curriculum perceived lectures, PBL tutorials and PBL self-directed study as more important than did the students graduating from the transitional curriculum.

#### *Preparation for practice: A survey of supervisors/employers of pharmacy graduates*

Supervisors/employers were asked to rate how well they felt the pharmacy program prepared (from 1 = very well prepared to 5 = very poorly prepared) graduates from all three curricula to confidently perform the 50 activities/competencies from *the expected curricular outcomes of the Dalhousie College of Pharmacy*. Because of the low return rate of the survey (Table I), statistical tests were not conducted to determine significant differences.

In general, little difference was perceived by the supervisors/employers between the three groups of graduates in their preparedness for the activities/competencies, with most of the ratings in the category of “well prepared”. However, Table V shows the 11 activities/competencies for which some differences were noted. There were no activities/competencies that the supervisors/employers perceived the graduates to be poorly or very poorly prepared for practice. However, all graduates were perceived by the supervisors/employers to be only “somewhat prepared” in the activities/competencies Participate in Formulary Planning and Evaluation (in the category: *contribute to decision making regarding safe, effective and efficient use of drugs*) and Understand/Apply Marketing Principles (in the category *manage the business and practice environment of pharmacy*).

Table I. Response rates for questionnaires.

Questionnaire type	Lecture-based curriculum	Transitional curriculum	PBL curriculum
Graduating student survey	86.4% (51/59)*	81% (102/126)	85% (108/127)
Supervisor/employer survey	47.7% (21/44)	25.6% (22/86)	26.5% (22/83)
Preceptor survey	n/a <sup>†</sup>	53.4% (31/58) <sup>‡</sup>	51.2% (21/41)

\* Percentage (number of respondents divided by number of questionnaires distributed); <sup>†</sup> Not applicable (project did not start until the year 2000); <sup>‡</sup> Only the preceptors of the class of 2000 included in this survey.



Table II. Activities/competencies of practice for which students graduating from the PBL curriculum perceived themselves to be prepared differently\* compared to students graduating from the transitional and lecture-based curricula.

A. Activities/competencies of practice that students graduating from PBL curriculum perceived themselves to be better prepared than those from both the transitional and lecture-based curricula

1. *Meeting clients medication related and health needs*
  - 1.1 Establish the relationship with client
  - 1.2 Obtain necessary information from clients/physician
  - 1.3 Understand/assess client's needs/expectations
  - 1.5 Provision of specific client care:
    - 1.5.1 Communication skills
    - 1.5.3 Documentation of care
2. *Contribute to decision making regarding safe, effective and efficient use of drugs*
  - 2.5 Participate in health promotion/illness prevention activities
4. *Continuously improve professional competence through a commitment to life-long learning*
  - 4.1 Demonstrate skills of self-assessment and reflection
  - 4.2 Identify areas of needed change or improvement
  - 4.3 Actively seek and implement solutions
  - 4.4 Evaluate for improvement
6. *Skills, abilities and values*
  - 6.1 Oral, written, technologically mediated communication skills
  - 6.3 Stress management and adaptive skills
  - 6.4 Leadership
  - 6.5 Problem solving skills
  - 6.6 Self-directed learning
  - 6.9 Critical thinking skills
  - 6.10 Information identification, retrieval, appraisal and integration

B. Activities/competencies of practice that students graduating from PBL curriculum perceived themselves to be better prepared than those from transitional curriculum

1. *Meeting clients medication related and health needs*
  - 1.4 Identify/solve/prevent drug related problems:
    - 1.4.1 Command of relevant disease knowledge
    - 1.4.2 Command of relevant treatment knowledge
    - 1.4.3 Command of relevant pharmaceutical knowledge
    - 1.4.4 Assessment/evaluation of treatment options
    - 1.4.5 Development of pharmacy care plan
    - 1.4.6 Selection of alternatives
  - 1.5 Provision of specific client care:
    - 1.5.4 Evaluation/follow-up of outcomes
2. *Contribute to decision making regarding safe, effective and efficient use of drugs*
  - 2.1 Contribute to improvement of population based health indicators
  - 2.2 Understand health care system/trends
  - 2.3 Understand systems for public/individual well-being
  - 2.7 Participate in formulary planning and evaluation
3. *Manage the business and practice environment of pharmacy*
  - 3.2 Understand/apply on-going quality assurance
  - 3.5 Understand/uphold standards of practice
  - 3.6 Understand/adhere to laws and regulations
  - 3.7 Manage personnel, systems and resources
5. *Contribute to renewal and advancement of profession*
  - 5.2 Participate in professional organizations
  - 5.3 Participate in pharmacy education
6. *Skills, abilities and values*
  - 6.2 Time management skills
  - 6.7 Analysis/action based on ethical principles
  - 6.11 Education effectively
  - 6.12 Computer literacy

\*Statistically significant differences are based on overall level of significance of 5%. Results are not presented for activities/competencies where there was no statistical difference in perceived preparedness between students graduating from the PBL, lecture-based or transitional curricula.

Table III. Activities/competencies of practice for which students graduating from all three curricula perceived themselves to be most and least prepared.

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- Most prepared (range of averages\*: 1.73–2.29)
- 1.4.2 Command of relevant treatment knowledge
  - 1.4.3 Command of relevant pharmaceutical knowledge
  - 1.4.4 Assessment of treatment options
  - 6.8 Exhibit professional values and demeanour
- Least prepared (range of averages: 2.88–3.65)
- 2.1 Contribute to improvement of population based health indicators
  - 2.4 Collaborate to influence policy development to enhance health status and well-being
  - 2.7 Participate in formulary planning and evaluation
  - 2.8 Participate in drug utilization reviews
  - 2.9 Participate in pharmacoeconomic analysis of therapeutic choices
  - 3.3 Understand/apply appropriate pharmacy management systems
  - 3.7 Manage personnel, systems and resources
  - 3.8 Understand/apply marketing principles
- 

\*Rating scale, Very well prepared = 1–1.99; Well prepared = 2–2.99; Somewhat prepared = 3–3.99; Poorly prepared = 4–4.99; Very poorly prepared = 5.

Supervisors/employers were also asked how well they felt the pharmacy program had prepared the graduates for practice (from 1 = very well prepared to 5 = very poorly prepared). The type of curriculum did not seem to affect the opinions of the supervisors/employers as to the degree of preparation of the graduates (Table IV).

#### *Preparation for final year practice experience program: A survey of pharmacy preceptors*

The percentage of usable returns was similar for the transitional and the PBL curricula as shown in Table I. The preceptors were asked how well prepared (from 1 = very well prepared to 5 = very poorly prepared) the students were to perform the 50 clinical activities required as part of the six required components of the final year PEP; the few differences are reported in Table VI. The preceptors were to make the assessment based on the first time they observed the student perform the activity during the program. There were no statistically significant differences among the curricula in the preparedness of the students as perceived by the preceptors. Preceptors were asked to rate (from 1 = excellent to 5 = very poor) the students on 16 professional characteristics ranging from problem solving abilities to communication skills to professional demeanour. There were no statistically significant differences among the curricula in the preceptors' ratings of the professional characteristics of the students. Finally, the preceptors were asked how well prepared the students were for the final year PEP in terms of knowledge, skills, attitudes and ability to adapt to the activities performed during the PEP. Again, there were no statistically significant differences among the curricula in the preceptors' ratings of the students' preparation in any area.

Table IV. Overall perception of preparation for practice as perceived by graduating students and by supervisors/employers.

Respondent	Lecture-based curriculum Average $\pm$ SD* (N) <sup>†</sup>	Transitional curriculum Average $\pm$ SD (N)	PBL curriculum Average $\pm$ SD (N)
Graduating students <sup>‡</sup>	2.16 $\pm$ 0.55 (49)	2.66 $\pm$ 0.78 (90)	2.16 $\pm$ 0.66 (88)
Supervisors/employers	2.00 $\pm$ 0.77 (21)	1.82 $\pm$ 0.79 (22)	2.00 $\pm$ 0.69 (22)

\* Rating scale: Very well prepared = 1–1.99; Well prepared = 2–2.99; Somewhat prepared = 3–3.99; Poorly prepared = 4–4.99; Very poorly prepared = 5.00; <sup>†</sup>Number of respondents; <sup>‡</sup>Students graduating from the lecture-based and PBL curricula perceived themselves to be statistically better at a level of significance of 5% than did those graduating from the transitional curriculum.

## Discussion

### *Educational experience and preparation for practice: A survey of graduating pharmacy students*

The return rates for the questionnaire were excellent for the graduating students. This was probably the result of having a dedicated time in class to complete the questionnaire. The students graduating from the PBL curriculum perceived themselves to be significantly better prepared than did the students graduating from the other two curricula in 17 activities/competencies, as noted in Table II. In the PBL curriculum, cases are used along with a standard problem solving process to stimulate student learning. Students must reflect on what they know, what they need to learn, seek out that information, educate their group members and apply the new information back to the case. Learning opportunities for a wide variety of skills are also offered in a two and a half year critical appraisal series of classes and a 4 years skills laboratory. Thus, it is encouraging to see from these survey results that students graduating from the PBL curriculum perceived themselves to be better prepared than did those from the other two

curricula in many of the activities/competencies under continuously improve professional competence through a commitment to life-long learning and skills, abilities and values as many of these are emphasized in the PBL curriculum.

Although students graduating from the PBL curriculum perceived themselves to be as well prepared or better prepared than did the students graduating from the lecture-based and transitional curricula in some areas, there were 11 activities/competencies for which their perception of preparedness was no different from that of the students graduating from the other two curricula. Several of these same activities/competencies also received lower ratings in terms of level of preparedness from the students graduating from all three curricula (data not shown). The curricular content in these areas did not differ significantly among the three curricula so it is not surprising that there was no difference in perceived preparedness among the cohorts. These results are under review by the curriculum committee to determine if there is a need for curricular change.

Table V. Activities/competencies of practice for which graduates of the three curricula were perceived by supervisors/employers to be differently prepared\*.

Activity/competency of practice	Lecture-based curriculum	Transitional curriculum	PBL curriculum
1. Meeting clients medication related and health needs			
1.4.4 Assessment/evaluation of treatment options	++	+++	++
2. Contribute to decision making regarding safe, effective and efficient use of drugs			
2.4 Collaborate to influence policy development to enhance health status and well-being	+	+	++
3. Manage the business and practice environment of pharmacy			
3.3 Understand/apply appropriate pharmacy management systems	++	++	+
3.7 Manage personnel, systems and resources	+	++	+
5. Contribute to renewal and advancement of profession			
5.1 Understand/participate in research as appropriate	++	+	++
6. Skills, abilities and values			
6.1 Oral, written, technologically mediated communication skills	+++	++	+++
6.6 Self-directed learning	+++	++	+++
6.7 Analysis/action based on ethical principles	+++	+++	++
6.9 Critical thinking skills	+++	++	+++
6.10 Information identification, retrieval, appraisal and integration	+++	++	+++
6.11 Educate effectively	++	+++	+++

\*+++ , Very well prepared (scale of 1–1.99); ++ , Well prepared (2–2.99); + , Somewhat prepared (3–3.99).

Table VI. Clinical performances for which graduates of the transitional and PBL curricula were perceived by preceptors to be differently prepared\*.

Clinical performances	Transitional curriculum	PBL curriculum
1. <i>Patient interview</i>		
1.1 Systematically review patient's chart/profile prior to the interview	++	+
1.9 Demonstrate appropriate concern and empathy for the patient	+++	++
2. <i>Pharmaceutical care</i>		
2.8 Implement a therapeutic monitoring plan	++	+
5. <i>Drug information requests</i>		
5.5 Use electronic databases correctly and efficiently	++	+++

\*+++ , Very well prepared (scale of 1–1.99); ++, Well prepared (2–2.99); +, Somewhat prepared (3–3.99).

#### *Preparation for practice: A survey of supervisors/employers of pharmacy graduates*

It was more difficult than anticipated to identify the graduates' first place of employment which may partially account for the low return rate of this survey. Additionally, as the questionnaire was mailed out 1–2 years after graduation many of the graduates had already changed jobs. This survey was administered during a time when pharmacy jobs were plentiful and there was a great deal of competition for pharmacists, causing much movement in the workforce.

The supervisors/employers rated graduates from all three curricula very similarly in terms of preparation for the activities/competencies of practice. The majority of all the supervisors/employers appeared to consider that the graduates were very well to well prepared for practice. In general, the supervisors/employers of all graduating classes perceived that the graduates were only somewhat prepared for two activities/competencies, namely, Participate in Formulary Planning and Evaluation in the category *contribute to decision making regarding safe, effective and efficient use of drugs*) and Understand/Apply Marketing Principles (in the category *manage the business and practice environment of pharmacy*). It was of interest to note that students graduating from all three curricula perceived themselves to be only somewhat prepared for the same two activities/competencies as well. These activities/competencies are currently under review by the curriculum committee.

#### *Preparation for final year practice experience program: A survey of pharmacy preceptors*

The return rates for this questionnaire were about 50% with both groups. The plan to use only preceptors who had supervised students from both curricula was intended to allow for a better comparison. However, this may have had a negative impact on sample size, as can be seen in Table I. There was an unexpectedly high turnover of preceptors during this time as pharmacists were being heavily recruited for vacant positions in the workforce. While previously the College had little turnover of a core group of preceptors from year to year,

this changed dramatically during the time this questionnaire was distributed.

Results from this questionnaire suggest that there were no statistically significant differences in the preparation for the final year PEP between the students of the PBL curriculum and the transitional curriculum. Preceptors perceived that students from both curricula were in most areas, well prepared or very well prepared for practice (differences shown in Table VI). However, there were several specific activities for which the preceptors felt the students were not as well prepared (compared to other activities) regardless of curriculum:

#### *Patient interview*

- Systematically review patients' charts/profile prior to interview
- Consult with health care professional(s) prior to interview

#### *Pharmaceutical Care*

- Interpret patient information
- Establish outcomes for drug related problems
- Identify and evaluate alternatives
- Select most appropriate therapy
- Make recommendations to health care professional(s)
- Develop a therapeutic monitoring plan
- Implement a therapeutic monitoring plan

Subsequent changes were made to the PBL curriculum, the 4 years skills laboratories and earlier PEP to provide more emphasis and opportunity for students to practice pharmaceutical care activities prior to the final year PEP. Skills laboratories were also modified to further emphasize a systematic approach to patient assessment.

One of the strengths of the comprehensive curriculum evaluation plan was that feedback from various methods could be compared and patterns identified. Subsequent modifications could then be made to different components of the curriculum based on feedback from more than one source. For example,

the curricular modifications described in the previous section were made after review of results of the preceptor survey combined with the results of the surveys of the graduating students and supervisors/employers, as well as feedback received from graduating year curriculum discussion and feedback sessions (Appendix A).

*Strengths/Limitations* The College was able to implement several evaluation methods almost concurrently with the implementation of the PBL curriculum. This made it possible to compare graduating students' preparation for practice based on their curriculum during their time in the program. Unfortunately, of the classes included in the comparison, only the class of 1998 had completed all studies in the lecture-based curriculum. The classes of 1999 and 2000 had been exposed to at least one, and potentially three courses in PBL. Administering the survey to the graduating students during a dedicated class time appeared to have a positive impact on the return rates. However, since students were just about to graduate the timing may have impacted their ratings differently than if the survey was administered at another time. The need for the supervisors/employers and preceptors to sign a consent form and return it with the questionnaire may be the reason for the less than ideal return rates of these two surveys. Due to time constraints, the preceptor survey could not be implemented as early as the graduating student and supervisor/employer surveys, when a class from the lecture-based curriculum could have been used as a comparator.

It was important to use several evaluation methods to gain perspective on the graduating students' preparation for practice from a variety of sources since it is difficult to know if differences were due to the type of curriculum, expectations that a new curriculum would be more effective, other factors or a combination. It is also difficult to determine the educational significance of the results, thus supporting the use of a variety of evaluation methods. The results of the surveys measuring perceptions were compared with other measures of student performance: course examinations, internal progress examinations and Pharmacy Examining Board of Canada national examinations. However, each method of evaluation on its own has inherent limitations. For example, survey results are dependent on the recall of the responder who might also have biases. There was undoubtedly some subjectivity in the responder's ratings. It is difficult to know if the ratings are a result of the individual student(s) aptitude, other experiences or due to the type of curriculum. Additionally, the supervisor/employer and preceptor surveys were sent out 6 months–2 years after the student had graduated, potentially making it difficult for the responder to recall a specific student's actual performance. There were no exclusions of supervisors/em-

ployers or preceptors who may have previously employed or precepted a graduate; therefore, the employer or preceptor may have a bias as to the level of preparation of graduates. The samples of supervisors/employers and preceptors were not randomly selected as they were chosen based on the criteria that they employed/precepted Dalhousie University pharmacy graduates.

## Conclusion

In conclusion, with the implementation of the outcomes-based, integrated, hybrid PBL curriculum it was important for the College to evaluate and continuously monitor the effect of the curriculum change on the preparation of graduates for practice. Surveys of the graduating students have provided data indicating that the students graduating from the PBL curriculum perceive themselves to be as well or better prepared as did those graduating from the lecture-based curriculum. Results of the preceptors' survey suggest that preceptors believe the PBL curriculum prepares students for the final year PEP as well as did the transitional curriculum. Similarly, responses from the supervisors/employers suggest that respondents believe that the innovative PBL curriculum is effective at providing the knowledge and skills that graduates need today to practice pharmacy. It is important that these results be combined with those of other means of evaluation to gain a comprehensive perspective of the graduates overall preparation for practice.

## Acknowledgements

The authors would like to thank the graduating students, and preceptors and supervisors/employers of Dalhousie University College of Pharmacy students for completing these surveys. Financial support was received from the Dalhousie Pharmacy Endowment Fund. Dr. Patrick Farmer was the beneficiary of a 3-year Canadian Foundation for Pharmacy/Apotex Theme Grant. Additionally, the authors would like to thank Ms. Elizabeth Foy, Professional Information Officer, for her help with literature searching and retrieval; Ms. Tracy Jollymore for her secretarial assistance; and Dr. Choong Foong who was an Associate Professor at the Dalhousie University Faculty of Dentistry when the projects were initially planned and implemented. Dr. Kristin Janke, a former faculty member of the College of Pharmacy, is acknowledged as initiating funding support and developing a version of a graduate survey from which the first survey described herein was developed. We would also like to thank Ms. Marilyn Johnson and Mrs. Carolyn Burley as well as pharmacists Dylana Arsenault, Denise Sprague, Andre Mallet and Jeff Spiers (who were pharmacy student research assistants at the time of the research) for their assistance with various components of this research.



## References

- Guilbert, J. J. (1998). Comparison of the opinion of students and teachers concerning medical education programmes in Switzerland. *Medical Education*, 32, 65–69.
- Hill, L. H., & Kirkwood, C. K. (2005). Student and preceptor perception of performance in advance pharmacy practice experiences. *American Journal of Pharmaceutical Education*, 69(4), 467–474.
- Hill, J., Rolfe, I. E., Pearson, S. A., & Heathcote, A. (1998). Do junior doctors feel they are prepared for hospital practice?. A study of graduates from traditional and non-traditional medical schools. *Medical Education*, 32, 19–24.
- Hoej, J. J., & Gardner, D. C. (1999). Using surveys of alumni and their employers to improve an institution. *New Directions for Institutional Research*, 101, 43–59.
- Holdford, D., & Reinders, T. P. (2001). Development of an instrument to assess student perceptions of the quality of pharmaceutical education. *American Journal of Pharmaceutical Education*, 65, 125–131.
- Howard, P. A., Henry, D. W., & Fincham, J. E. (1998). Assessment of graduate outcomes: Focus on professional and community activities. *American Journal of Pharmaceutical Education*, 62, 31–36.
- Kirkpatrick, D. (1996). Great ideas revisited: Revisiting Kirkpatrick's four-level model. *Training and Development*, 50(1), 54–58.
- Kirkpatrick, M. A. F., & Pugh, C. B. (2001). Assessment of curricular competency outcomes. *American Journal of Pharmaceutical Education*, 65, 217–224.
- Macnab, A., Martin, J., Duffy, D., & Murray, G. (1998). Measurement of how well a paediatric training programme prepares graduates for their chosen career paths. *Medical Education*, 32, 363–366.
- Parish, R. C., Morton, M. R., Francisco, G. E., & McCombs, J. (1993). Opinions relating professional competencies and curricular needs. *American Journal of Pharmaceutical Education*, 57, 325–330.
- Revised Educational Outcomes for a Baccalaureate Pharmacy Program in Canada. Final Report May 1998, Association of Faculties of Pharmacy of Canada. Available at: <http://www.afpc.info/>. Accessed November 15, 2005.
- Reznick, R. K., Brewer, M. L., Wesley, R. M., Spencer, D. L., & Folse, J. R. (1988). The practicing doctor's perspective on the surgical curriculum. *American Journal of Surgery*, 156, 38–43.
- Ried, D., Brazeau, G. A., Kimberlin, C., Meldrum, M., & McKenzie, M. (2002). Students' perceptions of their preparation to provide pharmaceutical care. *American Journal of Pharmaceutical Education*, 66, 347–356.
- Sayers, R., Carroll, J. J., & Loesch, L. C. (1996). Follow-up surveys for counsellor preparation program graduates and their employers. *Counsellor Education and Supervision*, 35, 179–189.
- Scott, D. M., Robinson, D. H., Augustine, S. C., Roche, E. B., & Ueda, C. T. (2002). Development of a professional pharmacy outcomes assessment plan based on student abilities and competencies. *American Journal of Pharmaceutical Education*, 66, 357–364.
- Villanueva, A. M., Kaye, D., Abdelhak, S. S., & Morahan, P. S. (1995). Comparing selection criteria of residency directors and physicians' employers. *Academic Medicine*, 70, 261–271.
- Whelan, A. M., Mansour, S., & Farmer, P. (2002). Outcomes-based integrated hybrid PBL curriculum. *American Journal of Pharmaceutical Education*, 66, 302–311.
- Woodward, C. A., & Ferrier, B. M. (1982). Perspectives of graduates two or five years after graduation from a three-year medical school. *Journal of Medical Education*, 57, 294–302.
- Woodward, C. A., & Ferrier, B. M. (1983). The content of the medical curriculum at McMaster university: Graduates' evaluation of their preparation for postgraduate training. *Medical Education*, 17, 54–60.

## Appendix A. Curriculum evaluation plan

### Student evaluation of the curriculum

1. Structured Evaluation of the Curriculum While at the College
  - 1.1 Curriculum Component Assessments
  - 1.2 Faculty/Tutor Assessments
2. Graduating Year Curriculum Discussion and Feedback
3. Structured Student Evaluation of the Curriculum Upon Graduation
  - 3.1 Educational Experience and Preparation for Practice: A Survey of Dalhousie University Graduating Pharmacy Students.

### Student performance as an evaluation of the curriculum

1. Outcomes Assessment within the Curriculum
2. Multiple Choice Progress Exam
3. Objective Structured Clinical Examination
4. Pharmacy Examining Board of Canada Examinations
5. Preparation for Final Year Practice Experience Program: A Survey of Dalhousie University Pharmacy Preceptors
6. Preparation for Practice: A Survey of Supervisors/Employers of Dalhousie University Pharmacy Graduates
7. Student Achievement Beyond Graduation.

### Faculty/tutor evaluation of the curriculum

1. Curriculum Retreats
2. Peer Tutor Assessment
3. Tutor Evaluations.

### Comparison of PBL curriculum graduates with those from the lecture-based and transitional curricula

1. Pharmacy Examining Board of Canada Examinations
2. Multiple Choice Progress Examination
3. Educational Experience and Preparation for Practice: A Survey of Dalhousie University Graduating Pharmacy Students
4. Preparation for Practice: A Survey of Supervisors/Employers of Dalhousie University Pharmacy Graduates
5. Preparation for Final Year Practice Experience Program: A Survey of Dalhousie University Pharmacy Preceptors.