

Learning Outcomes and Program-level Evaluation in a 4-Year Undergraduate Pharmacy Curriculum

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ABSTRACT

Objective: The Faculty of Pharmaceutical Sciences program at the University of British Columbia has recently implemented program-level learning outcomes throughout the 4 years of the redesigned undergraduate curriculum (B.Sc.Pharm). This paper presents a framework to examine whether and how learning outcomes have been implemented in practice.

Method: A comprehensive and iterative program evaluation framework was applied to provide a broad and long perspective through which to investigate whether and how program-level learning outcomes were implemented.

Assessment: Data from this study suggest that program accreditation, the leadership qualities of the curriculum Chair, a strong and adequately resourced curriculum team whom were able to engage and mobilize the Faculty learning community, and scholarly approaches to curriculum reform, were critical factors in the successful development and implementation of program-level learning outcomes in this context.

Conclusion: An integrated range of institutional and programmatic strategies enhance the implementation of program-level learning outcomes in a 4-year Undergraduate curriculum.

LEARNING OUTCOMES AND PROGRAM-LEVEL EVALUATION IN A 4-YEAR UNDERGRADUATE PHARMACY CURRICULUM

INTRODUCTION

Although not an entirely new concept in university Pharmacy curricula, program-level learning outcomes are part of a broader context of pedagogical reform. Program-level learning outcomes focus on higher order and integrated learning abilities (e.g., demonstrate critical thinking, responsible use of ethical principles, effective research, communication and problem-solving skills) in the context of Pharmaceutical Education, and are designed to be assessable, transferable, and relevant to students' lives as workers and citizens in a diverse world.^{1,2,3} In pragmatic ways, program-level learning outcomes inform students what they can expect to achieve from a program of study, so they can organise their time and efforts; they communicate curriculum/program goals in a meaningful way to a broader community; they help to determine the extent to which learning has been accomplished; and, they guide faculty and administrators (within resource constraints), in part, to determine program(s) of study, course objectives, appropriate learning experiences, assessment and program evaluation strategies. In order to meet the needs and circumstances of undergraduate curricula, program-level learning outcomes should be developed by representative members of the whole learning community in order to embrace a wide range of interpretations and adaptations.⁴ Not surprisingly, therefore, the localised development and declaration of contemporary program-level learning outcomes can be a major undertaking for most institutions and academic units. Furthermore, addressing critical issues such as “how do we actually know that students are able to demonstrate these outcomes on completion of our degree program” present significant challenges for many faculty members and administrators.^{5,6} Very little research has investigated whether and how program-level learning outcomes are actually implemented in practice. This paper examines whether and how learning outcomes are implemented in a redesigned learning-centred 4-year undergraduate curriculum in the Faculty of Pharmaceutical Sciences at the University of British Columbia (UBC), Canada.

Pharmacy Program Context

The UBC Faculty of Pharmaceutical Sciences includes 30 full-time equivalent faculty and 550 undergraduate students in a four-year B.Sc. (Pharm) Program. Within the Pharmaceutical Sciences program, there are five sub-disciplinary streams: Pharmaceutics, Pharmacology, Pharmaceutical Chemistry and Drug Metabolism, Clinical Pharmacy, and Pharmacy Practice. Students are required to complete at least one year of general sciences prior to admission to the B.Sc. program.

Following extensive consultation and curriculum redesign efforts from 1998 to 2001, the Faculty developed and launched a learning-centred curriculum which focussed around critical graduation expectancies and a core set of nine learning outcomes. Furthermore, through various faculty development strategies, these learning outcomes were connected to a wide range of potential assessment methods and learning strategies, in large part, to enhance authentic implementation.^{7,8,9,10,11,12} Table 1 provides examples of how the ability-based learning outcomes were intended to connect to authentic methods of assessment and diverse learning modules within the redesigned 4-year learning-centred undergraduate curriculum.

ENTER TABLE 1 HERE

To ensure a well-designed and cohesive UBC Pharmaceutical Sciences program, specific attention was paid to vertical and horizontal curriculum integration. For example, disciplinary-based ‘Working Groups’ were established to develop course streams over the 4 years of the program and integrate (vertical integration) the learning outcomes with appropriate learning experiences and assessment strategies within the sub-disciplinary field. Horizontal

integration of knowledge and skills across the disciplines was co-ordinated by the curriculum committee and Chair by designing case-based learning modules (entitled Cases in Pharmaceutical Sciences, CAPS) which students take continuously throughout the four-year program.³ This redesigned learning-centred 4-year undergraduate curriculum is now in its fourth year of implementation. A program evaluation framework was developed to examine the implementation of program-level learning outcomes in this undergraduate curriculum.

METHOD

Program Evaluation Framework

The following program evaluation framework has been employed by educational developers and university teachers in various higher education settings.^{8,3,13,14} This flexible and iterative evaluation framework was applied to examine whether and how learning outcomes were implemented in the 4-year undergraduate program in the UBC Faculty of Pharmaceutical Sciences. Figures 1 and 2 provide two representations of the program evaluation framework. Figure 1 illustrates an heuristic model which captures the critical role of action research and the contextual, iterative and interdependent nature of program evaluation components. Figure 2 illustrates a pragmatic model for the learning context, process, impact and follow-up evaluation phases of implementation analysis.

[ENTER FIGURE 1 HERE]

Figure 1. An heuristic model conceptualising the interrelationship of critical components in the program evaluation framework

[ENTER FIGURE 2 HERE]

Figure 2. A pragmatic program evaluation model conceptualising key phases of implementation analysis

This framework takes into account the institutional learning context and integrates a wide range of program evaluation strategies. Action research methodology is central to this framework. Action research internalizes theory and practice through a systematic and cyclical process of inquiry that involves hypothesis testing, planning, observing, analysis, and action.¹⁵ Essentially, action research invites curriculum leaders to consider which research questions around program evaluation are important, what data to gather, when and how to collect and analyse these data, how to initiate positive changes to practice, how to engage curriculum stakeholders in the process, and, finally, to consider how this research might be of interest to the broader scholarly community. Data collection strategies may be in the form of quantitative (e.g., numeric performance and graduation records, rating and rank-order preference scales), and/or qualitative sources (e.g., internet or documentation searches, open-ended feedback forms and/or interviews, interpretation of teaching performances from video footage, teaching plans, students' assignments, workbook journals, etc.). Appropriate combinations of qualitative and quantitative data can yield critical information to enhance program evaluation.¹⁸ Action research was used in this study to provide data on which to reflect upon the effectiveness of program processes and outcomes (e.g., examine input from faculty, practitioners, students, quality of student's work, course instructors' experiences), and to engage key stakeholders in the process of implementation analysis.

Learning context evaluations. These address key issues such as the intended audience for the evaluation, the objectives of the evaluation, and available resources to conduct specified

evaluation projects. For example, learning context evaluations might include: researching relevant literature, assessing perceived needs of various stakeholder groups about program processes and outcomes, and evaluating program feasibility issues. What needs to be improved, why, how?

Process evaluations. These focus on periodic assessments of issues of importance that arise throughout the program (formative). For example, to what extent are learning outcomes made explicitly clear to students through, for example, course syllabi? How do students best achieve learning outcomes? To what extent do learning experiences integrate learning outcomes? What are the strengths and weaknesses of program learning experiences? What needs to be improved, why, how?

Impact evaluations. These focus on issues of importance that occur as a result of a program (summative) evaluation. For example, how do students demonstrate learning outcomes? To what extent does the program meet, surpass, or fall short of learning outcomes, why and how? What needs to be improved, why, how?

Follow-up evaluations. These focus on issues of importance which arose as a result of the longer term (e.g., months, year) impact of a program. For example, as a student reflects upon the program and learning outcomes, what does he/she remember and value most? Generally speaking, to whom and to what extent, if at all, did the learning outcomes make any difference? If at all, how did the program contribute to the student's development as a pharmacist and citizen in a diverse world?

The following section describes how this program evaluation framework was employed to examine whether and how learning outcomes were implemented in the four-year Pharmaceutical Sciences undergraduate curriculum.

Application of Program Evaluation Framework

Table 2 indicates a series of action research questions that were initiated to examine whether and how learning outcomes were implemented in the Pharmaceutical Sciences undergraduate curriculum. Data collection strategies were tailored to each specific research question under investigation.

ENTER TABLE 2 HERE

Data Collection

A learning context evaluation (Q 1) was conducted prior to the program, whereby data were gathered over a 1 year period as part of a comprehensive needs assessment. For example, the entire faculty were engaged collectively, and through disciplinary streams, in open-dialogue to develop learning outcomes and integrated learning experiences. This was particularly effective through "Town hall" meetings (i.e., discussion fora about curriculum issues for faculty, administrators, students and professionals in the field), notice-board information about on-going issues and progress with curriculum reform process, individual and focus group interviews with faculty members, and e-mail surveys and consultation with student and professional groups. Various data sources were compiled to examine the extent to which learning outcomes were reflected in individual course offerings (process evaluation, Q 2). These included a review of a representative sample of course syllabi, and the reflection notes from the curriculum Chair in order to assess progress, strengths and weaknesses of the implementation of learning outcomes in program learning experiences. To assess whether and how learning outcomes were demonstrated by students (impact evaluation, Q 3), researchers analysed data from summative program evaluation questionnaires, focus group interviews with curriculum stream leaders, and a representative sample of student surveys and examples of students' work. Finally, researchers analyzed one-year follow-up data (follow-up evaluation, Q 4) to assess the long-term impact and applications of implementing learning outcomes in the 4-year

Pharmacy undergraduate program. Data were gathered from a sample of responses from student surveys, pharmacist practitioner feedback comments, analysis of examples of student's final project assignments, and a review of faculty research activities in the 2005/06 academic year. In addition, follow-up interviews were conducted with members of the Faculty's curriculum evaluation team and Chair to highlight progress, critical long-term aspects of implementing learning outcomes, and suggestions for further program-level improvements.

Researchers analyzed qualitative data for common and isolated experiences and for major themes.¹⁷ Quantitative data, on the other hand, were analyzed using descriptive statistics.

RESULTS

Learning context evaluation (Question 1). Previous studies have provided a more detailed analysis for the above learning context evaluation question.^{8,19,3} Interview data with the Curriculum Chair and disciplinary 'stream' leaders suggested that external program accreditation was the single biggest factor to influence the development and implementation of program-level learning outcomes. Furthermore, external consultant support, strong curriculum leadership and the ability to engage and mobilize the whole learning community (i.e., representative students, faculty, and stakeholders in the broader program context) through open-dialogue and various communications were critical factors. The lack of academic release time, especially for the Curriculum Chair, hindered progress and momentum to fully develop program-level learning outcomes in a smooth and timely fashion.²⁰ Too many ability-based outcomes (9) have likely contributed to the additional challenges experienced with implementing these outcomes across the whole curriculum and within the five program streams and individual courses. Several of the listed outcomes could be integrated and simplified (e.g., 5 and 9, 2 and 4).

Process evaluation (Question 2). To assist with authentic implementation of program-level learning outcomes, curriculum planning documents revealed that specific courses at key stages throughout the curriculum (e.g., CAPS courses and experiential-based courses), were strategically targeted to incorporate all 9 learning outcomes (table 1). CAPS modules were intended to integrate learning across the sub-disciplines and cases increased in complexity from year 1 to 4. Experiential clerkships allowed for students to build upon the ability-based outcomes acquired during the first, second and third years of the undergraduate program in order to provide pharmaceutical care to patients in a variety of environments. Table 3 indicates the nature of integrated learning strategies undertaken by students in the experiential-based course (Phar 489) related to the nine learning outcomes. To assess completion of the learning outcomes, the following data were collected: end of year feedback surveys submitted by students and preceptors; periodic stakeholder focus group sessions; review of students' work submitted via portfolio; WebCT discussions with students; informal (telephone, site visits, face-to-face) discussions with students and preceptors; and, student/preceptor competency surveys and discussions during clinical instructor education programs. For example, a review of the Phar 489 course syllabus revealed that a student paper and oral presentation with the preceptor was employed to assess a student's ability to critically appraise primary literature sources on key aspects of pharmaceutical care in this context."

ENTER TABLE 3 HERE

All teaching faculty were also responsible to ensure that all individual courses, within their stream, included at least 3 outcomes in course syllabi. While this implementation strategy is useful for faculty members in the beginning stages of curriculum reform, it does not really address the balanced implementation of all [9] learning outcomes. Furthermore, following a review of a representative sample (40%) of course syllabi that were posted on the Faculty's

Undergraduate Curriculum WebCT site, most course syllabi had only identified one or two of the listed learning outcomes.

Impact evaluation (Question 3). Table 4 summarizes 1176 student responses (from the teaching evaluation questionnaire) across 15 second-year courses in the B.Sc.(Pharm.) curriculum (2005) pertaining to their perceptions about the alignment of course learning outcomes with the instructional methods and assessment practices.

ENTER TABLE 4 HERE

Course evaluation data suggest that approximately 70% of students felt that instructional methods facilitated the achievement of learning outcomes. Traditional lecturing techniques and an examination assessment method remain effective strategies for ability-based outcomes such as mathematical skills. Much follow-up work remains to be done to fully integrate and monitor all learning outcomes across the curriculum. Second, these data suggest that approximately three quarters of students felt that assessment practices were generally related to learning outcomes. In addition to the CAPS courses, experiential-based course work (table 3) required students to demonstrate the program-level learning outcomes in a wide range of assessment methods. In particular, the use of [E-] portfolio assessment in the context of these courses proved to be a particularly effective method for students to demonstrate and integrate all 9 learning outcomes in diverse ways. Essentially, the portfolios provided a framework, in electronic or paper format, for students to reflect on and record their professional and practice development activities (e.g. problem solving examples, patient care situations, preceptor assessments, self-assessments and other documentation relating to their progress throughout the duration of their program). The documentation/evidence was evaluated according to pre-determined criteria: quality of evidence related to learning outcomes; explanatory (integration and application of learning); evaluative (quality of analysis and effectiveness of application); developmental (reflect on further goals/learning required); and, quality of presentation. In contrast, a review of a representative sample (40%) of course syllabi, however, indicated that overall individual course assessment methods tended to be heavily weighted toward traditional mid-term and final examinations, which have significant limitations for the assessment of the outcome-based abilities, beyond the knowledge domain. Student survey data also suggested that very few individual course offerings offered formative assessments of the learning outcomes.

Follow-up evaluation (Question 4). Although it is recognised that on-going refinements and adjustments to the curriculum are inevitable, survey feedback data and focus group interviews suggest that the program-level learning outcomes have generally been met very favourably by students, practicing Pharmacists and faculty members thus far in the 4th year of implementation. There is widespread agreement among faculty and pharmacy practitioners that student confidence and competencies have increased in experiential placement modules; the use of effective learning technologies (e.g., mixed-mode blended WebCT courses) within the curriculum has greatly increased in order to monitor and integrate learning outcomes within and across sub-disciplinary course streams; and a number of faculty members commented that their teaching evaluations had now become more useful and detailed with both quantitative and qualitative data pertaining to the use of learning outcomes in the context of a given course.

Several on-going implementation challenges surfaced from these data. Notably, the implementation of learning outcomes (in these relatively early stages) has tended to be inconsistent across the five sub-disciplinary streams. In some cases, only 1-2 outcomes are being addressed within courses and traditional lecturing and exams are the format for course delivery. While this strategy can be useful in the early stages of implementing learning outcomes, a wider repertoire of teaching and learning strategies are required in order to address the broad range of learning outcomes (and student's learning styles). The sheer quantity of program-level learning outcomes (n=9) did present overwhelming challenges for

some faculty members. Most faculty members also commented on the impact of the learning outcomes on their workload:

...my initial teaching workload increased significantly [with the new curriculum] but my course is now better aligned with the whole curriculum and I now tend to invest my preparation time more toward active learning processes rather than focus exclusively on course content. I'm still working on this!

Based on data in this study, specific strategies would further enhance the implementation of learning outcomes in this context including: professional development strategies for faculty (e.g., continued enrolments in the UBC Faculty Teaching Certificate Programme, workshops and 1-to-1 assistance on learning strategies, and authentic assessment of learning outcomes) and students (e.g., learning outcomes orientation workshops, portfolio tutorials); and, programmatic strategies (e.g., learning-centred course design, program-level student [E-] portfolios required at the end of years 2, 3, and 4 of the undergraduate curriculum).

Consistent with the ethos of action research, it was clear from the survey data that there is a 'culture of evaluation' within the Pharmacy program for faculty, students and curriculum leaders. It is interesting to note that there have been several highly funded projects around the scholarship of teaching and learning (e.g., program evaluations, CAPS and experiential-based project development, technology and curriculum learning outcomes) that have been awarded by the University's Teaching and Learning Enhancement Fund to members of the Pharmacy faculty. Furthermore, several peer-reviewed publications and conference presentations have resulted from action research projects in this curriculum context.

In recognition of the importance for the scholarship of curriculum practice in this setting, this Faculty has developed a part-time position for a coordinator to oversee undergraduate program evaluation projects. On-going action research projects will examine various aspects of program processes and outcomes (e.g., How do graduates apply learning outcomes in pharmacy practice, what is the impact of learning outcomes on students' grades, what is the impact of learning outcomes on teaching evaluation scores). More details about specific curriculum research projects can be found on the Faculty's program evaluation website: http://www.pharmacy.ubc.ca/undergraduate_programs/program_evaluation.html

DISCUSSION

As institutions and academic units globally, 'grapple' with the challenges of developing and adopting program-level learning outcomes, this study provides a useful framework for implementation analysis and how program-level learning outcomes are implemented in the context of a 4-year undergraduate curriculum. By taking into account the learning context and providing a long and broad perspective to investigate the implementation of program-level learning outcomes in higher education, this framework is adaptable to a wide range of institutional and programmatic settings. Action research methodology is at the very heart of this framework, and was employed to identify critical research questions for investigation, to gather and analyse authentic data on which to (cyclically) reflect on the implementation of program-level learning outcomes, as well as to respond with refinements to practice and further questions for continuous investigation.

Students demonstrated program-level learning outcomes through various learning experiences and assessment methods. Integrated case-based courses, capstone projects, and student [E-] portfolios were particularly valuable learning experiences for students to demonstrate a comprehensive set of integrated program-level learning outcomes. Institutional and Faculty-level support for curriculum reform, especially in the form of adequate time for professional development (e.g., workshop support for developing authentic methods of assessment and a wide range of learning experiences that connect directly to program-level

learning outcomes) is key to helping faculty members implement learning outcomes within individual course and program learning experiences. Several faculty members in this curriculum context were enrolled in an 8-month certificate program on the scholarship of teaching and learning in higher education.¹³ This comprehensive professional development opportunity provided a forum in which to study relevant literature, debate, analyse and develop strategies to enhance curriculum reform in the Pharmaceutical Sciences setting.

Implementing program-level learning outcomes in an 4-year undergraduate curriculum is a contextually-bound, complex and multi-faceted process. It is shaped by many factors (individual, social, political, economic, organizational, and cultural) and involves many people (administrators, facilitators, faculty, instructors, and students) at various stages and sub-disciplinary streams throughout the program. It is not surprising in this study, therefore, that despite coordinated and strategic attempts to adopt well-developed program learning outcomes, they were not fully implemented, as intended, in the complex world of curriculum practice. Furthermore, while valuable lessons can be learned about the development and implementation of program-level learning outcomes in this undergraduate context, these experiences are unlikely to transfer exactly to other undergraduate program settings.

CONCLUSION

This article provides a flexible program evaluation framework to examine whether and how program-level learning outcomes are implemented in an undergraduate curriculum. Data from this study suggest that integrating a comprehensive range of institutional and programmatic strategies will enhance the implementation of program-level learning outcomes. For example, program accreditation, the leadership qualities of the curriculum Chair, a strong and adequately resourced curriculum team whom were able to engage and mobilize the Faculty learning community, and scholarly approaches to curriculum reform, were critical factors in the successful development and implementation of program-level learning outcomes in this context.

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REFERENCES

- 1) Baird, L. L. Documenting student outcomes in graduate and professional programs. In A. E. Bilder and C.F. Conrad (Eds) *Challenges in assessing outcomes in graduate and professional education*, New Directions for Institutional Research. 1996;92:77-87.
- 2) Clanchy, J., Ballard, B. Generic skills in the context of higher education. *Higher Education Research and Development*. 1995;14(2):155-166.
- 3) Hubball, H.T., Burt, H.D. An Integrated Approach to Developing and Implementing Learning-Centred Curricula. *International Journal for Academic Development*. 2004;9(1):51-65.
- 4) Cox, M., Richlin, L. Building faculty learning communities (Eds), 97, *New Directions for Teaching and Learning*, San Francisco, CA: Jossey-Bass. 2004.
- 5) Drummond, I., Nixon, I. Wiltshire, J. Personal transferable skills in higher education: The problems of implementing good practice. *Quality Assurance in Education*. 1998;6(1):44-58.
- 6) Shavelson, R., Huang, L. Responding responsibly to the frenzy to assess learning in higher education. *Change*. 2003:11-18.
- 7) Adamcik, B., Hurley, S., Erramouspe, J. Assessment of pharmacy students' critical thinking and problem-solving abilities. *American Journal of Pharmaceutical Education*. 1996;60:256-265.
- 8) Albon, S., Hubball, H.T. (2004). Course Design in Pharmaceutical Sciences: A Learning-Centred Approach. *American Journal of Pharmaceutical Education*. 2004;68(5), article 114.
- 9) Albon, S., Cancilla, D., Hubball, H.T. (In press). Using Remote Access to Scientific Instrumentation to Create Authentic Learning Activities in Pharmaceutical Analysis. *American Journal for Pharmaceutical Education*.
- 10) Brandt, B.F., Clements, M., Piascik, P. Problem-solving activities for first-year pharmacy students. *American Journal of Pharmaceutical Education*. 1998;62:450-457.
- 11) Lockhart, M., and Borland, K.W. Critical thinking goals, outcomes, and pedagogy in *senior capstone courses*. *The Journal of Faculty Development*. 2001;18(1): 19-25.
- 12) Raman-Wilms, L. Innovative enabling strategies in self-directed, problem-based therapeutics: Enhancing student preparedness for pharmaceutical care practice. *American Journal of Pharmaceutical Education*. 2001;65:56-64.
- 13) Hubball, H.T., Burt, H.D. Scholarship of Teaching and Learning: Theory Practice Integration in Faculty Certificate Programs. *Innovative Higher Education*. 2006;30(5):327-344.
- 14) Hubball, H.T., Levy, A. Graduate Course Design in Health Care and Epidemiology A Learning-Centred Approach. *Journal for Faculty Development*. 2004;20(1):11-19.
- 15) Mills, G. E. *Action Research: A Guide for the Teacher Researcher*. Upper Saddle River, New Jersey: Merrill Prentice Hall. 2000.

16) Altrichter, H., Psch, P., Somekh, B. *Teachers investigate their work: An Introduction to the methods of action research*. London, England: Routledge. 1993.

17) Strauss A., Corbin, J. *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd edition). Thousand Oaks, CA: Sage. 1998.

18) Wolfe, P., Hill, A., Evers, F. *A Handbook for Curriculum Assessment*. University of Guelph Publications, Ontario. 2006.

19) Burt, H. *Learning Outcomes Report*. Faculty of Pharmaceutical Sciences Curriculum Document. 2000.

http://www.pharmacy.ubc.ca/undergraduate_programs/program_evaluation.html

20) Schneider, C.G., Shoenberg, R. (1999). Habits hard to break: How persistent features of campus life frustrate curricular reform. *Change*. 1999:30-35.

Table 1. Ability-based Outcomes, Assessment Strategies and Learning Modules in the Four-Year Pharmacy Curriculum



Outcome	Assessment tools	Learning Modules to Address Overall Ability-Based Outcomes
1. Critical thinking skills	<ul style="list-style-type: none"> -In class, take home, exam cases -Written reports -Problem sets -Case presentations -Debates -Self, peer, assessment - Program Portfolio 	<div style="text-align: center;">  </div> <p>Problem-based Learning</p> <p>Web-based Learning</p> <p>Lectures</p> <p>Laboratories</p> <p>Practica</p> <p>Learning Portfolios</p> <p>CAPS (case-based learning)</p> <div style="text-align: center;">  </div>
2. Information access and evaluation	<ul style="list-style-type: none"> -Library assignments -Critical review of literature -Debate of literature -Mini lecture 	
3. Communication skills	<ul style="list-style-type: none"> -Written exams -Written reports -Oral presentations -Videotape counseling -Practical lab exams -Essays -Self, peer evaluations -Program portfolio 	
4. Scientific inquiry skills	<ul style="list-style-type: none"> -Analysis of evidence and data -Laboratory results and reports -Written evaluations of literature 	
5. Self-directed learning skills	<ul style="list-style-type: none"> -Program Portfolio -Quizzes, exams, reports, assignments -Self, peer evaluation -Case analysis 	
6. Math skills	<ul style="list-style-type: none"> -Quizzes -Problem sets -Lab reports -Assignments -Exams 	
7. Interpersonal and teamwork skills	<ul style="list-style-type: none"> -Self and peer assessments -Program portfolio 	
8. Ethical behaviour & social awareness	<ul style="list-style-type: none"> -Case studies -Portfolio -Self and peer assessments 	
9. Apply and integrate knowledge	<ul style="list-style-type: none"> -Written cases -Written problems to solve 	

Table 2. Implementation Analysis: Program Evaluation Questions

Learning Context Evaluation Question

- Q. 1 What are the critical factors when developing program-level learning outcomes?

Process Evaluation Question

- Q. 2 To what extent are learning outcomes reflected in program learning experiences?

Impact Evaluation Question

- Q. 3 When and how do students demonstrate learning outcomes in this context?

Follow-up Evaluation Question

- Q. 4 What are the overall reflections for implementation and alternative applications of learning outcomes to other academic activities in this context?
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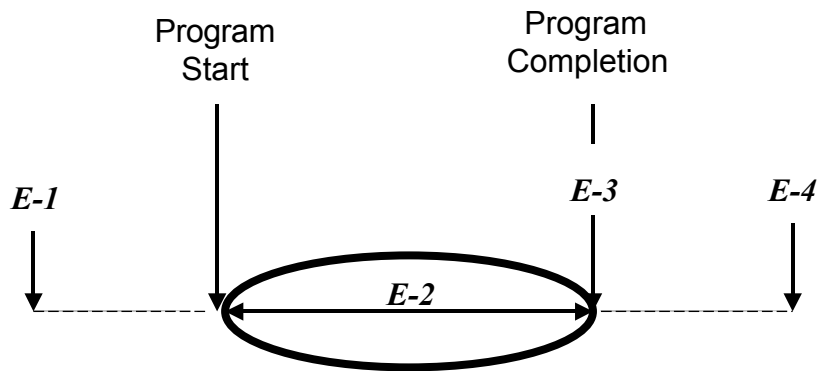
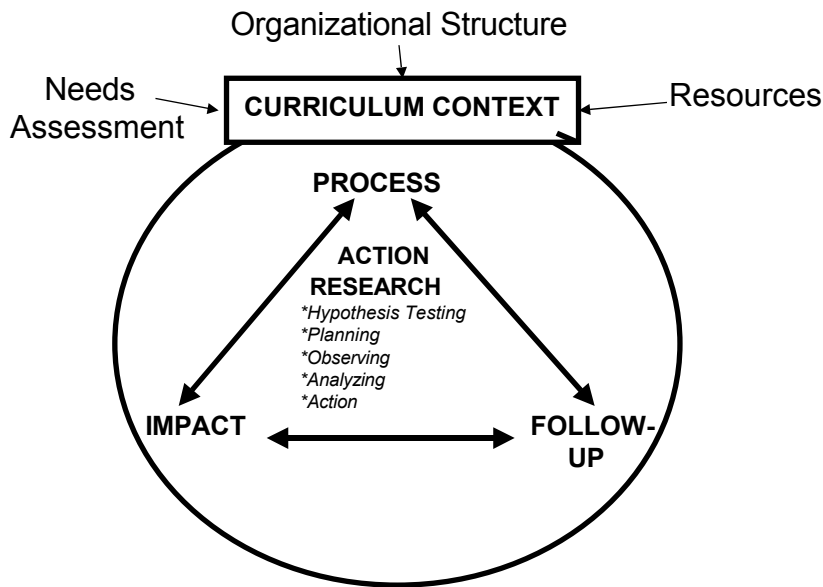
Table 3. The nature of integrated learning strategies undertaken by students in the field-based course related to the nine learning outcomes.

Activity Description	LEARNING STRATEGIES
Comprehensive Pharmaceutical Care	Provide Comprehensive PC to patients to resolve/prevent drug-related problems (DRPs). Create a Pharmacist Work-up of DrugTherapy (PWDT). Identify DRPs. List all DRPs identified in the PWDT. Create pharmacy care plans for all DRPs identified. Work with the physician and/or patient to resolve the DRPs. Follow-up (FU) with all patients. Document all care provided.
Drug Review Process	Participate in drug review in the dispensary. Participate in daily drug review process on designated unit.
Allergy Assessment	Assess patients for drug allergies and write a note in the chart or file form in patient chart per institutional policy.
Medication Teaching/ Discharge Counseling	Provide medication teaching to in-patients prior to discharge
Presentations	Present a patient-focused care case Present one in-service (optional)
Critical Appraisal of Literature	Critically review one article of interest with preceptor informally, or Present a critical appraisal of primary literature at a journal club
Drug Information (DI)	Work-up drug information questions raised by patients or other healthcare professionals. Document all drug information (DI) questions on the DI form provided.
Inter-professional Collaboration	Liaise with non-pharmacy health care providers to optimize care. Attend patient care conferences/bedside rounds/kardex reviews. -Attend interdisciplinary educational sessions

Table 4. *Second year students' survey responses about the alignment of course learning outcomes with the instructional methods and assessment practices (N=1176).*

Question	Responses					
	0 No Response	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
The instructional methods (lectures, case studies, group projects, laboratory activities, etc.) facilitated achievement of the learning outcomes.	8 (0.68%)	54 (4.59%)	79 (6.72%)	217 (18.45%)	561 (47.70%)	257 (21.85%)
The assessments of learning in this course were related to the learning outcomes.	9 (0.77%)	37 (3.15%)	76 (6.46%)	182 (15.48%)	568 (48.30%)	304 25.85%

Figure 1. An heuristic model conceptualising the interrelationship of critical components in the program evaluation framework



PROGRAM EVALUATION PHASES

CONTEXT CONSIDERATIONS: Audience, Objectives, Resources for Evaluation Projects

E-1: Learning Context Evaluations

E-2: Process Evaluations

E-3: Impact Evaluations

E-4: Follow-up Evaluations

Figure 2. A pragmatic program evaluation model conceptualising key phases of implementation analysis