

# Final Assessment Report

## Pharmacy (MSc, PhD)

### March 2017

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#### Summary of the Program Review:

In accordance with the University Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the arm's length external evaluation and the internal response and assessments of the MSc and PhD programs delivered by the School of Pharmacy. The Self-Study Volume I, was provided to the Associate Provost, Graduate Studies in June 2016. Self-Study Volume I, included program descriptions, learning outcomes, and an analytical assessment of the programs, as well as, the standard data package prepared by the Office of Institutional Analysis & Planning (IAP). Volume II of the Self-Study contained the CVs for full-time tenured, tenure-track positions and continuing lecturers affiliated with these programs.

Two arm's-length external reviewers were selected by the Associate Provost, Graduate Studies: Professor Afsaneh Lavasanifar (Pharmacy and Pharmaceutical Sciences, University of Alberta) and Associate Dean of Research Stephane Angers (Faculty of Pharmaceutical Sciences, University of Toronto). Professor Lutz-Alexander Busch (Department of Economics) served as the University's internal reviewer.

Lavasanifar and Angers reviewed the Self-Study documentation and conducted a site visit on November 7-8<sup>th</sup>, 2016. The visit included interviews with the Vice-President Academic & Provost, Associate Provost, Graduate Studies, Associate Dean, Graduate Studies and Research of the Faculty of Science, the Hallman Director of the School of Pharmacy, Associate Director, Graduate Studies and Research, School of Pharmacy, as well as a Liaison Librarian and Library Department Head of Information Services, various faculty members, administrative staff and a group of current graduate students.

A tour of the School of Pharmacy building included research labs and core facilities, graduate student offices, graduate lounge and animal holding facility. The research labs are an open concept design, well lit, spacious, and nicely finished with excellent bench space and numerous small rooms available for instrumentation, microscopy, tissue culture, radioactive material, freezers, etc. Graduate students/post docs have good work areas within shared office space and a comfortable lounge for informal meetings. The facility does not seem to be completely full and there seems to be some space to grow, especially with some renovations being completed in the basement that could house a biomedical researcher in the future.

This final assessment report is based on information extracted, in many cases verbatim, from the self-study, the external reviewers' report and the program response.

#### **Program characteristics:**

**MSc in Pharmacy:** The MSc in Pharmacy program has two fields of study 1) Pharmaceutics: Drug and Vaccine Delivery Systems and Nanomedicine; and 2) Drug Design: Molecular Pharmacology, Pharmacokinetics and Toxicology. These fields prepare students for further academic study or for careers in the pharmaceutical industry or health professions, including those in hospitals, other healthcare facilities and government.

**PhD in Pharmacy:** The PhD program in Pharmacy has one, broad field of study: Pharmaceutical Discovery and Evaluation. The PhD in Pharmacy prepares students for advanced research careers in academia, government, healthcare or industry. The program provides students with the experience and skills needed to be able to design and implement independent and creative research projects, to effectively analyze and evaluate research data, and to communicate their analysis of research data in a variety of academic and non-academic settings. It is expected that their independent work will lead to both peer-reviewed publications and oral conference presentations. Upon graduation, our PhD students are anticipated to make significant contributions in their chosen career path.

#### **Summary of strengths, challenges and weaknesses based on self-study:**

##### **Strengths**

- Supportive & encouraging environment; good student/faculty relationship
- Strength and diversity of research faculty
- Pleasant physical working environment, 'office space and open-concept laboratory space'
- Program offers a cohesive approach with experiences that can cross boundaries within the pharmaceutical sciences or the study of pharmacy practice
- Newly created Associate Dean, Research and Graduate Studies position fosters both research success in the environment and career support within the graduate student community (e.g., bi-weekly research seminars and a research and career skills program)

### **Challenges/ Weaknesses**

- Dynamic changes in the School as it has developed its programs, transitioned to the PharmD (entry-to-practice Doctor of Pharmacy), and finally secured a definite budget
- Task of developing a suitable support structure for pharmacy practice research
- Evolving the program in an environment that is not affiliated to a health centre and not fully familiar with the unique tasks and opportunities that are inherent to a professional school
- Long process to balance the initial emphasis on the pharmaceutical sciences with clinical teaching in the undergraduate program
- Recruitment of a full complement of practice-based faculty (principally qualified Pharmacists) was not complete until 2015
- Greatest weakness for the graduate program itself at this point is the absence of any 'clinical' (practice-based) courses
- Having a pharmacy school located in a university that has no medical school or similar institution has perhaps delayed the rapid development of a graduate program with a superior [inter]national profile
- There is a divide between the local operating environment and the practices and potential characteristic of a research endeavor and graduate program within a professional school. These center on two issues: (i) expectations around evaluation of performance (e.g., Evaluation of a trainee in a health professional graduate program is not comparable to that of a trainee in a quantitative program in pure science), and (ii) administrative support (e.g., there are both pharma- and internationally-based research opportunities that are currently not being explored due to a need for more administrative support for research activities)

### **Opportunities for Improvement and Enhancement**

- There is a great deal of interest among current as well as prospective graduate students for a graduate program that includes an aspect of practical training, either through internships and/or co-op programs
- Discussions with industry partners are on-going, and it is expected that within the next two years, these can be included as part of the Pharmacy graduate programs
- The elimination of the post-baccalaureate PharmD program at the University of Toronto has created a void and has led to discussions at both Waterloo and the University of Toronto about the development of a clinical MSc program that would include didactic coursework, advanced clinical training and a clinical research project

- Within the Faculty of Science, there are a number of international joint (PhD) degree programs, ranging from 2 + 2 PhD programs (where students spend a total of two years at Waterloo and two years at their home institution) to dual degree and cotutelle programs, which are open for participation in by Pharmacy faculty. These programs provide an opportunity for international collaboration, further enhancing our programs

**Summary of key findings from the external reviewers:**

Overall, the reviewers were impressed with the dedication and strength of the faculty members and of the support staff as well as the quality of the graduate programs. Since the last review, several steps were taken towards advancing graduate studies in the School of Pharmacy. These include: the implementation of a seminar series; preparation of a handbook for rules and regulations; and hiring of a lab technician. In the last few years, the School has been focused on the transition to the PharmD program, which required the development and implementation of a new curriculum. This necessitated double teaching duties for most Faculty members (to finish teaching the BSc cohort and begin the PharmD program courses).

Therefore, perhaps expectedly, less attention was directed towards the Graduate programs. As a result, there is a shortage of graduate course offerings, especially in clinical areas and this was identified by the students as a limitation for the programs. Now that the School has reached a critical mass of graduate Faculty members, including in the Pharmacy Practice and clinical areas and that the PharmD curriculum is fully implemented, the School should focus on developing, (or offering on a more regular basis) additional graduate courses especially in the clinical and pharmacy practice areas.

**Program response to external reviewer recommendations:****Recommendations**

1. We recommend the School to be pro-active and reach out to the Faculty of Science to identify CFI opportunities and secure funding allocations.

**Response:**

The School of Pharmacy was successful in receiving a CFI allocation for the Fall 2016 JELF competition. Unfortunately this grant was not successful and the School intends to re-apply in the Fall 2017 competition.

2. We recommend use of a shuttle system or allocation of transportation funds to individual graduate students to facilitate transport of supplies and movement of students between the main campus and the School.

**Response:**

The School currently provides a shuttle service between the Pharmacy building and the main UW campus for transportation of research samples and supplies; this service is to be used *only* where transportation of materials is required, and not for general transit between campuses. All UW students have access to Grand River Transit, which operates multiple bus routes that stop at both the Pharmacy building and on main campus, providing excellent transportation options to graduate students; this service is included in the graduate student fees for full-time service, allowing them access to the transit system at no additional cost. In 2018, a new light rail transit system will begin operation within the Region of Waterloo, with stops right outside the Pharmacy building and on the main campus; this will provide even more transportation options for students.

3. We recommend that the University and School of Pharmacy think about a sustainable budget plan that can guarantee the stipend for at least 4 years (during the funding cohort) for PhD students and 2 years for MSc students in both streams should the research funding of the supervisor face trouble in renewal.

**Response:**

The School of Pharmacy is currently working with both the Faculty of Science and the Graduate Studies Office to develop a funding strategy for students should supervisor funding not be renewed.

4. We recommend that the School reaches out to the Graduate Office of the Faculty of Science to explore alternative funding strategies and models for graduate student support.

**Response:**

See response 3, above.

5. Development of a recruitment strategy for attracting excellent, prospective graduate students is strongly recommended.

**Response:**

The Faculty of Science Graduate Studies and Research committee (of which the School of Pharmacy is a part) is currently developing recruiting strategies to recruit outstanding potential graduate students. A key component of this is a complete redesign of Graduate Studies web pages both within the School of Pharmacy and the Faculty of Science. The new Pharmacy

Graduate Studies web page can be found at [https://uwaterloo.ca/ pharmacy/ graduate-students-0](https://uwaterloo.ca/pharmacy/graduate-students-0).

6. The School should focus on developing, (or offering on a more regular basis) additional graduate courses especially in the clinical and pharmacy practice areas

**Response:**

The School is committed to the development of additional graduate courses and several strategies will be employed to increase the number of course offerings. The Associate Director, Research and Graduate studies will work with the Associate Director Curriculum and the Curriculum Committee to examine courses in the PharmD curriculum which could be offered to graduate students with additional assignments and/or assessments. Similarly, we will explore opportunities for the delivery of courses in conjunction with other academic units (e.g., School of Optometry; Faculty of Applied Health Sciences) that could be team taught, decreasing the workload for faculty offering graduate courses. In addition, the School will work with the offices of the Dean of Science, and the Associate Dean of Science for Graduate Studies to examine ways in which recognition of, and reward for graduate teaching can be provided.

One option may be to advertise our graduate course offerings to other departments, increasing the enrollment to a level such that the course could be counted towards a faculty member's teaching load; as an example, because our core course must be delivered at a minimum of once per year, the faculty member delivering this course *does* receive credit for it with respect to their annual teaching load. The Graduate Studies and Research Committee will also work to develop terms of reference for a new school award for Outstanding Teaching in the graduate program.

With respect to "*additional graduate courses especially in the clinical and pharmacy practice areas*" the School is exploring the development of a new clinical MSc and/or PhD program. The goal of the program will be to develop clinical scientists and medication experts to meet the needs of academia, government, and health care institutions. It is likely that a number of clinical and applied courses would need to be developed to support this program. The continued growth of the faculty at the School of Pharmacy and the possibility of offering courses jointly with University of Toronto should make the development of this program feasible within the next three years. A new faculty member in clinical pharmacy has been recruited (JM Gamble) and will begin his appointment in September 2017. The School is anticipating a second new hire in this area in late 2017/early 2018.

**Additional Reviewer Comments and Suggestions:****Comment:**

Some students commented that the name of the degree could be misleading. *Indeed, a designation of MSc or PhD in Pharmaceutical Sciences could better represent the scholarly activities of the School.* However, it is likely that administrative constraints prevent changing the designation of the degree. In any case, this could be explored. (External Reviewer's Report pg. 3)

**Response:**

The School is comfortable with the current name. The names of the graduate programs (MSc in Pharmacy and PhD in Pharmacy) were originally approved by the Ontario Council on Graduate Studies in 2010 and 2012, respectively. At the time of program submission, the names of the programs were chosen to broadly encompass research in all relevant areas of Pharmacy, including Pharmacy Practice, Clinical Pharmacy, and Pharmaceutical Sciences.

**Comment:**

Both students and faculty voiced the necessity for the development and consistent offering of more graduate courses at the School of Pharmacy particularly in the clinical stream. Several limitations restricting the capability of the faculty in offering of Pharmacy based graduate courses were recognized. *To overcome the problem, development of hybrid courses that can be taken by both PharmD students and graduate students was suggested. In this case, the expectations for completing the course may be different for the graduate students. For instance, the graduate students may be required to complete an additional essay or term paper. We also suggest that the School thinks about avenues to reward graduate teaching as part of their evaluation system to incentivize Faculty members to develop new courses and offer them on a regular basis.* (External Reviewer's Report pg. 4)

**Response:**

As suggested, we may be able to offer some of our current courses in the PharmD curriculum to graduate students with the graduate students completing additional assignments. Faculty can and will receive appropriate recognition for offering graduate courses in our annual performance review process, particularly when courses benefit students from multiple laboratories/research programs. We also remain committed to offering new clinical graduate programs which will require the development of a number of new courses. The School will soon have a sufficiently large complement of clinical/applied faculty to be able to offer a clinical MSc/PhD program and we have recently hired a staff member to provide guidance and support for obtaining the necessary approvals for these new programs.

The School of Pharmacy is exploring the possibility for the development of graduate industrial internship. This is recognized as a positive addition to the program. *The timing of the program was discussed, and we suggest that students be allowed to participate in internships or co-op only upon completion of all their program requirement and before the thesis defence.* (External Reviewer's Report pg. 4-5)

**Response:**

The Director and Associate Director, Research and Graduate Studies are working with various potential industry partners to explore opportunities for internships/co-op work placements. Should these opportunities become available, the above suggestion with respect to timing of the internships will be considered. We note that our experiences gained from our co-op PharmD program is that students are often more engaged with certain subject matter if they have been exposed to it, or have gained relevant experience related to such material in "real-world" settings. There may be benefit associated with having such internships take place *early* in the program, as opposed to after the completion of all other degree requirements.

Appropriate policies and procedures are in place for monitoring the progress and performance of students through graduate supervisory committee meetings. MSc students interested to transfer to the PhD program or direct entry PhD students are expected to complete a "comprehensive exam" within 2 years in the program. Whether this consists of a true traditional "comprehensive exam" that tests the depth of knowledge of the students on all aspects of the Pharmaceutical Sciences/Clinical Pharmacy or this is a more typical "transfer exam" that assess the knowledge on topics more directly related to the project of the students was unclear. *If the latter, perhaps this exam should be re-named "Transfer exam" (for MSc) or "Qualifying exam" (for direct entry students). It is also suggested that this exam become more structured, with members of the supervisory committee determining the areas to be covered in the exam beforehand.* (External Reviewer's Report pg. 5)

**Response:**

The "Comprehensive Exam" terminology applies to all PhD programs across the University of Waterloo and is a requirement for all PhD programs; as such, renaming the exam is not feasible. With respect to exam structure, currently supervisors are required to submit the names of the Comprehensive Examination Committee members (may or may not be the same as the Supervisory Committee) and the proposed topics and literature references to the Associate Director 10 weeks in advance of the examination date. References are then provided to the student 8 weeks in advance of the examination date. Approximately 4 weeks prior to the



examination, the supervisor provides both the proposed questions (3 per examiner) along with an outline of expectations for a “correct” answer. The questions are reviewed and approved by the Associate Director. This process is similar to those of other departments/schools within the University and appears to be consistent with the above recommendation. It may be the case that more detailed information regarding the timelines for the Comprehensive Examination need to be provided to graduate students, and the Graduate Officer will prepare a “Comprehensive Examination Information” document which can be provided to graduates students with questions about the process.

The School has experienced a healthy increase in funding from industrial partners and public non-profit sector in recent years, which is very good. Several faculty have been successful in CFI and NSERC RTI Funding for infrastructure. *Faculty members will need to continue seeking new and innovative sources of research funding. The initiative in industry/community partnered research is a good avenue.* (External Reviewer’s Report pg. 5-6)

**Response:**

The School of Pharmacy was successful in receiving a CFI allocation for the Fall 2016 JELF competition that was unfortunately not funded. This grant will be revised and resubmitted in the Fall 2017 competition. The Associate Director will work with faculty members to explore other avenues for industry/community sponsored research.

Most faculty have been involved in the supervision of MSc and PhD students. *When needed, Clinical Faculty may benefit from mentoring to ensure success in the supervision of graduate students in MSc, PhD and forthcoming clinical MSc program.* (External Reviewer’s Report pg. 6)

**Response:**

There are a number of mentoring opportunities available to all faculty members engaged in the supervision of graduate students that include: mentoring by other senior faculty within the School of Pharmacy; participation in graduate supervision workshops offered by the Center for Teaching Excellence; and participation as a member of a graduate supervisory committee. As the possibility of a clinical MSc program is developed, clinical faculty will be consulted regarding any additional mentorship (particularly in a clinical setting) which may be required. In addition, the Director and Associate Directors within the School will investigate a more formalized mentoring program for faculty within the School of Pharmacy, in which junior faculty are paired with one or more senior faculty members for mentoring in areas of graduate supervision, granting strategies, and graduate course development.

A minimum stipend is available to students. This minimum level has been increased since last review by more than \$2000/year, to \$22,350 and \$33,630 per year for domestic and international students, respectively, but it still seems modest. The Faculty of Science contributes \$3,000/MSc and \$6,000/PhD students. *We recommend that the University and School of Pharmacy think about a sustainable budget plan that can guarantee the stipend for at least 4 years (during the funding cohort) for PhD students and 2 years for MSc students in both streams should the research funding of the supervisor face trouble in renewal.* (External Reviewer's Report pg. 7)

**Response:**

See response 3 (page 5).

There appear to be sufficient travel funds for graduate students to present their research at scientific conferences. *However, the distribution structure of the funds may be revised for better use of the available resources. For example, instead of offering \$500/year to each student which is not enough to even cover the expenses of a flight, allocation of \$1000-2000 per program (MSc and PhD) for each student may be considered.* (External Reviewer's Report pg. 7)

**Response:**

Offering smaller amounts of funding (e.g. \$500 per student) allows us to support the travel needs of a larger number of students. We are aware that it would be ideal to be able to offer larger amounts per student and the School will continue to explore additional funding opportunities in this area.

*Development of a recruitment strategy for attracting excellent, prospective graduate students is strongly recommended.* It is apparent that there may be opportunities to expand the number of students holding Tri-Council funding or other scholarships. Some faculty mentioned that the timing of the application for the recruitment scholarships offered by the University (May of each year) is too late for the recruitment of good students as those individuals are usually proactive and apply to other competitive institution perhaps in January. *The timing of scholarship announcements should be re-examined.* (External Reviewer's Report pg. 7)

**Response:**

Unfortunately the School of Pharmacy has little control over the timing of University scholarship applications. The School of Pharmacy, along with the Faculty of Science and Graduate Studies and Postdoctoral Affairs, is working to improve the timeline associated with student acceptance timelines as a means of helping to alleviate the issue of scholarship

applications vs. recruiting. The School will examine recruitment strategies employed by other departments and faculties that are used to attract major scholarship holders (such as direct-entry to PhD (currently offered), and top-up funding).

Implementation Plan:

	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	We recommend the School to be pro-active and reach out to the Faculty of Science to identify CFI opportunities and secure funding allocations. (External Reviewer's Report pg. 6)	The School of Pharmacy was successful in receiving a CFI allocation for the Fall 2016 JELF competition. This was unsuccessful. The proposal will be revised and resubmitted in the Fall 2017 competition.	Associate Director, Graduate Studies and Research	October 1, 2017 submission deadline.
2.	We recommend use of a shuttle system or allocation of transportation funds to individual graduate students to facilitate transport of supplies and movement of students between the main campus and the School. (External Reviewer's Report pg. 6)	All UW students have access to Grand River Transit (this service is included in the graduate student fees for full-time service, allowing them access to the transit system at no additional cost), which operates multiple bus routes that stop at both the Pharmacy building and	N/A	N/A

		<p>main campus, providing excellent transportation options to graduate students; In 2018, a new light rail transit system will begin operation within the Region of Waterloo, with stops right outside the Pharmacy building and on the main campus; this will provide even more transportation options for students.</p>		
<p>3.</p>	<p>We recommend that the University and School of Pharmacy think about a sustainable budget plan that can guarantee the stipend for at least 4 years (during the funding cohort) for PhD students and 2 years for MSc students in both streams should the research funding of the supervisor face trouble in renewal.  (External Reviewer's Report pg. 7)</p>	<p>The School has implemented a process for approving bridging funding for these situation. Supervisors must first apply to both GSPA and the Faculty of Science bridge funds before being approved at the School level.</p>	<p>Associate Director, Research and Graduate Studies</p>	
<p>4.</p>	<p>We recommend that the School reaches out to</p>	<p>Currently in progress.</p>	<p>Associate Director,</p>	

	the Graduate Office of the Faculty of Science to explore alternative funding strategies and models for Graduate student support. (External Reviewer's Report pg. 7)		Research and Graduate Studies	
5.	Development of a recruitment strategy for attracting excellent, prospective graduate students is strongly recommended. (External Reviewer's Report pg. 7)	<p>Redesign of School Graduate Studies Web page</p> <p>Work with Faculty of Science on Faculty-wide recruiting strategies</p> <p>Incentive (bridging) funding for domestic students</p>	<p>Associate Director, Research and Graduate Studies</p> <p>Associate Director, Research and Graduate Studies</p> <p>N/A</p>	<p><b>Completed</b></p> <p><b>Ongoing</b></p> <p><b>Currently available</b></p>
6.	The School should focus on developing (or offering on a more regular basis) additional graduate courses especially in the clinical and pharmacy practice areas. (External Reviewer's Report pg. 8)	Consult with undergraduate curriculum committee to explore possibility of hybrid courses	Associate Director, Research and Graduate Studies	<p>Feasibility assessment</p> <p><b>Completed</b></p> <p>Implementation <b>Fall 2017</b></p> <p>New hybrid course offerings <b>Fall 2018</b></p>

	<p>Provide relief from undergraduate teaching to clinical faculty to free time for development of graduate courses</p> <p>Develop a new clinical MSc and/or PhD program</p>	<p>Hallman Director, School of Pharmacy</p> <p>Associate Director, Research and Graduate studies and Graduate Studies and Research Committee in conjunction with clinical /practice faculty</p>	<p>Teaching relief begins <b>Winter 2018</b></p> <p>Course development <b>Winter/Spring 2018</b></p> <p>New graduate course offerings <b>Fall 2018</b></p> <p>A new clinical graduate program will require the approval of the provincial government. Draft program proposal <b>FALL 2017</b></p> <p>Submission of program proposal to Senate <b>FALL 2018</b></p> <p>Submission of program proposal to OCGS <b>Spring 2019</b></p> <p>Site Visit and program approval <b>Fall 2019</b></p> <p>First student admissions <b>Fall 2020</b></p>
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The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for monitoring the Implementation Plan.

March 2017