

# Chemistry Program Review

Faculty of Science

## Dean's Summary

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Submitted by:

Dr. Lucy Lee, Dean of the Faculty of Science

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Accepted by:

Senate in June 2023

Academic Planning and Priorities Committee in May 2023

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## MEMORANDUM

Academic Planning and Priorities Committee

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**TO:** James Mandigo, Chair, Senate

**FROM:** Tracy Ryder Glass, Chair, Academic Planning and Priorities Committee

**CC:** Lucy Lee, Dean, Faculty Science  
Claire Carolan, Associate Director, Program Development and Quality Assurance

**DATE:** May 24, 2023

**RE:** Chemistry Program Review

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The Chemistry department within the Faculty of Science underwent a program review in 2022-23, it was initially delayed due to the COVID-19 pandemic. The Academic Planning and Priorities Committee (APPC) reviewed all of the documentation at its April 19, 2023 meeting and after requesting and receiving additional information which was added to item 2.2 in the table, the APPC motioned to accept the documents at its May 17, 2023 meeting and recommend to Senate for approval.

The APPC had no additional questions or comments to offer.

**SUGGESTED MOTION:**

THAT Senate accept the Dean's Summary Report of the Chemistry Program Review as presented.

**Attachments:**

- Memo from the Dean
- Memo from PDQA
- Dean's Summary Report

**Remainder of the documents located:**

- UFV Drive: H:\UFVinfo\APPC
- Blackboard: COM-APPC (Senate Committee – APPC)

## Department of Chemistry Program Review Implementation Recommendations in Response to Reviewers' Suggestions and Unit Responses

*prepared by Lucy Lee, Dean, Faculty of Science*

Jan 25, 2023 (Revised May 8, 2023)

### **Executive Summary**

The Chemistry Department is one of 5 units within the Faculty of Science, staffed by 9 permanent instructors (7 teaching faculty and 2 lab instructors), 2.9 FTE Lab Technicians (1 full time, and 1 each at 0.8, 0.6 and 0.5), and a 0.5 departmental assistant. A fluctuating number of 4 to 5 sessional instructors complement the instructional needs of this unit. The faculty, assisted by their competent staff, strive to offer exceptional chemistry education through experiential, hands-on learning in small classroom settings. They also strive to develop independent thinkers and creative learners that are ready to enter the workforce or pursue future studies in professional fields or to further chemical specialties through graduate studies. They provide instruction to about 30 BSc majors and 35 BSc minors, as well as over 700 distinct students in other programs as service teaching. Total enrolments in all courses offered by Chemistry range between 1000 to 1200 students annually with roughly 95% being domestic students. Distinct course offerings range between 10 to 14 per semester and several of these are offered in multiple sections, with first year courses (CHEM 113/114) being offered the most with enrolments around 500 students per year. See attached Self Study Report for details (**doc 2**). UFV Chemistry has offered BSc (Chemistry) major and minor since 2008. As of 2020 they also offer BSc (Biochemistry) and an Honours option for the BSc Chem degree. Note that the Biochem program is too new to be reviewed here and is scheduled for review this Fall 2023. The Chemistry Department has produced graduates with solid credentials, but the number of graduating students has been few (5 to 10/yr). Their students have had a high rate of placements either in the workforce or in continuing programs like Master's and Ph.D.'s, or into professional programs like medicine, pharmacy, or veterinary medicine.

The Program Review Panel consisted of 3 external faculty members: one from UNBC (panel chair); another from TRU; and another from a cognate department within UFV (internal-external member). The Panel reviewed the Chemistry Program Review documentation and interviewed faculty, staff and students during a site visit in May 2-3, 2022. Their report was forwarded to the Dean's office on June 9, 2022, and the Dean requested a slight clarification for which a final version was submitted July 11, 2022. Subsequent to this, the report was released to the Department on July 12, 2022. Overall, the reviewers commended the Chemistry Department and the instructional delivery offered but did note some deficiencies categorized under five headings: A) Program's contribution to the university's strategic goals; B) Alignment with ILO's; C) Academic Standards; D) Standards of Educational Practice; E) Utilization of Resources. See Review panel recommendations Report (**doc 3**). The unit prepared their responses and implementation plans to the review panel's recommendations and submitted a draft response on Nov 8, 2022. The Dean requested some revisions, and a final report was submitted on Jan 10, 2023.

### **Action Plan on Recommendations and Implementation Schedule**

The main challenges identified by the department and concurred by the review panel can be summarized into the following: 1) the physical state of the laboratories; 2) laboratory health and safety concerns; 3) course availability; 4) equipment/infrastructure maintenance; and 5) curriculum indigenization.

Most of these boil down to infrastructure needs, a problem that is echoed through-out the Faculty of Science. The reviewers praised the dedication of the unit to the success of the students and graduates, and indicated their support to the unit's initiatives in EDI and indigenization. The detailed Unit responses are attached (**doc 4**) along with my comments and suggestions with tentative schedule for action/plan implementation (**doc 5** - revised).

## Action Plan following External Reviewers recommendations for Chemistry.

Reviewers provided recommendations or noted deficiencies categorized under five headings noted below within Table:

A) Program's contribution to the university's strategic goals; B) Alignment with ILO's; C) Academic Standards; D) Standards of Educational Practice; E) Utilization of Resources.

For ease of referencing, the recommendations have been renumbered from 1-18. As well, for ease of viewing within table, some of the Unit's responses have been shortened but full documentation is available for perusal.

Rec #	External reviewers' recommendation	Unit Response	Action to be taken/Timeline
<b>A. Program's Contribution to the University's Strategic Goals, Vision, Mission, Plans, and Values</b>			
1	<b>2.1 – A more robust engagement with students at all grade levels throughout the region, through classroom visits, school visits, and on-campus K-12 student events. Chemistry is one of the most exciting disciplines from a public perspective and events involving chemistry magic shows and demonstrations generate a strong connection between the community and department.</b>	“Sporadic classroom visits/shows have occurred over the years, mostly through personal connections of faculty at a given school. But to mount a serious K-12 outreach program that is equally accessible to, and inclusive of, schools in the entire community would require much more time than is available to faculty members with full teaching loads and service and research commitments...” (Response shortened for brevity)	1) Engagement with students have occurred and is on-going. This was paused during the pandemic, but all Science units participate in several community outreach activities and have hosted many K-12 students on campus. / <a href="#">on going</a>  2) There is an expectation of service and faculty contribute to outreach activities as needed / <a href="#">on going</a>
2	<b>2.2 – Consider offering a course or workshop on the subject of indigenization, presented by a scientist with expertise in the area, for all faculty and staff within the department.</b>	“We support the introduction of Indigenous content or learning methods in those courses where it can be done in a meaningful and appropriate way by an instructor with relevant expertise. We are open to the reviewers' suggestion above, as long as it will be possible to have a free and open discussion of legitimate concerns about requiring Indigenization in all courses.”	1) As recommended by reviewers, invite Indigenous scientists or allies to expand Indigenization knowledge through workshops to be offered within the year/ <a href="#">by Spring 2024</a> 2) Include territorial acknowledgements either within Blackboard courses platform and/or in all course syllabi./ <a href="#">Fall 2023</a> . 3) Set up an informal group/ committee at the Faculty level to discuss Indigenization and allyship / <a href="#">already started</a>
3	<b>2.3 – Explore re-designing the timing or sequences for the delivery of some undergraduate labs (particularly first year) so that students engage with experiments before being taught the underlying theory. (For example, a Charles Law experiment prior to introducing the gas laws.)</b>	“We do not agree that this is a useful approach to university-level lab pedagogy. Even at the first-year level, theoretical background is essential, for example so that students can do necessary calculations before, during, and after the lab. We would like our lab students' minds to be engaged, thinking about what they are doing, as much as possible during hands on work. When students carry out a lab without understanding underlying theory, it encourages a “cookbook” approach...” (Response shortened for brevity)	1) This has been explored, and some virtual labs have been explored, but due to safety as noted in response for actual physical labs, this is not feasible at present. / <a href="#">no action</a>  2) Some lecture/lab courses could be separated as independent courses and there are plans to separate for example CHEM 341 into separate lecture and lab courses, but the lecture course would be a prerequisite for the lab course. / <a href="#">within the year</a>

<b>B. Alignment with Institutional Learning Outcomes</b>			
4	<b>3.1 – Ensure strong linkages between the program and course specific learning outcomes.</b>	“We will revisit LOs at some point when time permits, and we will also consider the new LO suggested above.”	1) Curriculum updating is a continuous process and is part of faculty’s workload to ensure there is strong linkage between program and course outcomes. / <a href="#">on going</a>
<b>C. Ministry, Professional/Industry, and Academic Standards</b>			
5	<b>4.1 Increase the fumehood capacity in upper-level laboratories to achieve a student-to-fumehoods ration of 2:1. At most two students should be sharing a fumehood during a laboratory section.</b>	“We agree, this would be ideal and consistent with current standards for modern teaching lab spaces. A renovation proposal was submitted over a year ago which proposed exactly what is recommended above. It is unclear at this point whether our plans will be approved.”	1) Upgrading of the A-West building that includes the Chemistry labs which are almost 40 yrs old, is among the top 5 priorities in our 2023-24 Five Year Capital Plan. Campus Planning recommended this as priority 3 out of 5 for Provincial funding. / <a href="#">within 5 yrs</a>
6	<b>4.2 Replace and update cabinetry and shelving in the undergraduate laboratories and address fundamental safety issues.</b>	“Again, these improvements have been proposed in our renovation proposal. The safety and space issues mentioned above are well known to administration and facilities management, but little substantive steps have been taken to address them.” (response shortened)	1) As noted above, a complete renovation plan at a cost of \$40 M has been noted in the 2023-24 Five Year Capital Plan. Safety repairs are being done on a continuous basis by Facilities / <a href="#">on going until full renovations within 5 yrs expected</a>
7	<b>4.3 Reconsider the design lay out of laboratory space or recommission additional space on campus for use in teaching chemistry laboratories. (Perhaps consider utilizing low service level laboratories for more than one degree program.)</b>	“Recommendations 4.1 through 4.3 would be addressed if our recently submitted renovation plans are approved and funded.”	1) As noted above, the Chemistry laboratories are close to 40 yrs old and hardware failure has been frequent in recent years. We submitted plans for renovation/updating, as well as expansion in previous Capital Plan requests and as frequency of leaks/breakdowns increases, this must become priority. / <a href="#">within 5 yrs</a>
8	<b>4.4 Establish adequate space to allow students to safely engage in upper-level independent study and research courses. In particular, research space needs to be provided for honours students.</b>	“Greater wet lab space for research would be ideal, and long overdue, but is unlikely to materialize in the foreseeable future within the current building space of the Abbotsford campus.”	1) Again as noted above renovation and expansion plans have been submitted in previous Capital Plan requests. Research students have been welcomed in the Biology labs if feasible to complete their projects. / <a href="#">within 5 yrs</a>
9	<b>4.5 Develop stability in the institutional Health and Safety Office and a system of periodic lab inspections.</b>	“This would be ideal, but is beyond the control of our department.”	1) The Health & Safety office has completed the hiring of key personnel, and safety lab inspections are being prioritized. / <a href="#">within the year</a>
10	<b>4.6 Apply for accreditation of the Chemistry degrees through the CSC.</b>	“We will discuss beginning the accreditation process.”	1) This is desirable but until the proper infrastructure is in place, this may take time. / <a href="#">5+ years</a>

11	<b>4.7 Re-structure the sequencing of the physical chemistry course curriculum to better reflect disciplinary norms. (i.e. Chemical Kinetics and Thermodynamics before Quantum Mechanics).</b>	“This course sequence was chosen originally to align our courses with the similar sequence offered by SFU (at the time, UFV did not offer BSc degrees of our own). Now that UFV offers degrees independently of SFU, we will reconsider the order of these courses in light of the reviewers’ recommendation.”	1) Curriculum updating is ongoing and as noted by the department’s response, this is being re-considered, thus the expectation is that changes are forthcoming. / <a href="#">within 1 yr</a>
12	<b>4.8 Hire a biochemist or, preferably two biochemists, to support the new degree program.</b>	“We hope that UFV administration will support the growing biochemistry major program with the hiring of more faculty with expertise in this area. We will advocate for this.”	1) The Biochemistry program is a joint program with Biology, and a faculty member with expertise in biochemistry was hired 2 years ago. As the program becomes popular, hiring of new faculty will be prioritized. / <a href="#">pending demand</a>
13	<b>4.9 Hire a chemist to replace some of the teaching being carried by sessional instructors.</b>	“We agree that this would be ideal, however we have seen no evidence that UFV is willing to reduce heavy reliance on non-permanent sessional and LTA instructors. From our perspective, UFV’s focus in recent years appears to have been creation of new positions in administration and non-instructional areas.”	1) Hiring of faculty is directly proportional to student demand, and student growth in Chemistry has been stationary. If demand increases, especially once the infrastructure is updated, we expect growth and this could be considered then. / <a href="#">5+ years</a>
14	<b>4.10 Explore the separation of lecture and laboratory components for all courses.</b>	“We have discussed this issue, and lab separation is being seriously considered for CHEM 341 so that students will learn theoretical aspects in lecture as a prerequisite for the lab course. Separation of labs may also be possible in other courses. For certain courses, however, lab separation is not desirable, as the lab content is integral to the lecture content (examples include CHEM 224, CHEM 324, CHEM 350, CHEM 422).”	1) This is being considered as it could also facilitate scheduling of labs, and as noted, CHEM 341 could be split into separate lecture and lab components. However, not all courses can be separated and the curriculum committee should consider pros and cons of splitting the lab and lecture components for all courses / <a href="#">within 3 years</a>
<b>D. Standards of Educational Practice</b>			
15	<b>5.1 Establish industry related work study or co-operative education opportunities.</b>	“UFV’s Center for Experiential and Career Education is tasked with coordinating co-op education opportunities. We would support any efforts by this centre to create more science co-op opportunities by engaging more with local industry.”	1) This is in place and students are getting work-study and co-op opportunities. We are alert for any student opportunities, and these are continuously communicated to students. / <a href="#">on going</a>
16	<b>5.2 Explore developing alternative routes for students to engage with local and regional industry.</b>	“We will discuss possibilities in this regard.”	1) Direct contact with local industries are leading to collaborative ventures / <a href="#">on going</a>

### E. Utilization of Resources

17	<b>6.1 More space or a restructuring of the present space to better accommodate both student numbers and faculty needs.</b>	“We fully support this recommendation. We have submitted a renovation proposal for teaching labs and prep space. More space would be ideal, but unlikely to materialize in the foreseeable future.”	1) We are in agreement and this was discussed under recommendations 4.1 to 4.4 / <a href="#">within 5 yrs</a>
18	<b>6.2 Establish a plan for the acquisition of a high-field NMR (possibly with the assistance of Pacifican, NSERC RTI or through institutional fund-raising efforts) and the budget for operational costs.</b>	“Dr. Linus Chiang has explored the costs and possibilities of acquiring and maintaining a high-field NMR instrument. Even if the cost of acquiring the instrument could be covered by one of the above-mentioned grants, the ongoing costs of maintenance and technician time would require a significant increase in the current departmental budget.”	1) The department has a bench top NMR for basic teaching purposes. Ideally, a high field NMR would be desirable but costs associated with its purchase and upkeep is currently outside our funding envelope. Applying for CFI or other external funding sources is encouraged. / <a href="#">within 5 yrs</a>