Chemistry & Biochemistry Department Response 2023

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This document provides an update to the prior department reports regarding the recommendations by the External Review Committee with regard to further progress and new initiatives. Items that were addressed in the prior report are not highlighted herein.

Undergraduate Teaching and Learning

Recommendation from Unit Review

2. The current size of the faculty should grow rather than decrease, in order to deliver the full program of service courses, and Majors and Honours in Chemistry & Biochemistry

The department has had 1 retirement of a faculty member and administrative assistant with the current administrative assistant in a 1-year term. A new faculty member (Dr. Marc MacKinnon) was hired to allow adequate coverage in 2nd and 3rd year organic chemistry courses which was deficient with the retirement of prior faculty member.

The number of faculty in the department has grown with one assistant professor in Chemistry (Dr. Cory Widdifield) and a CRC Tier 2 Chair in Biochemistry (Dr. Omar El-Halfawy). The department continues to have a diverse range of research opportunities for graduate students and undergraduate students.

The department continues to offer Major and Honours programs in Chemistry and Major and Honours programs in Biochemistry.

3.Increased support for graduate teaching assistantships should be provided to support undergraduate teaching program. This was identified as an overall financial recommendation made in the Undergraduate, Graduate and Staffing Sections, related to increased support for TAs

11. Increased support for graduate teaching assistantships should be provided not only to support undergraduate teaching program, but also to bolster enrolment opportunities in graduate school.

Our available resources for TAs has not increased and with further budget pressures at the University of Regina we are anticipating further reductions in budget available for TAs.

The department has already reduced TA resources to manage available budget and to maintain TA resources for all needs with large enrolment lectures changing assignment delivery through resources such as Top-Hat in General Chemistry and Wiley in Organic Chemistry utilizing on-line resources.

We also provide lab recitation in general chemistry I (CHEM104) which provides students opportunities for problem-solving skills development and this has transitioned from in-person prior to COVID-19 restrictions, to remote Zoom delivery to our new video-format that students can complete required

questions. We have a coordinator (faculty member) who continues to further develop this approach such that it requires minimum TA budgets.

Our students gain experiential hand-on lab experience through 1st, 2nd and 3rd year labs in chemistry and 2nd and 3rd year courses in biochemistry. Our priority of TA assignments continues to be in the laboratory particularly for service and major required courses which because of the size of labs we often have a TA available eg lab sizes pending room capacity limits for fire code range from 32-36. Some lab sizes may also be limited by special instrument needs.

In fall semester (9 lab sections of CHEM104, 4 lab sections of CHEM140, 2 lab sections of CHEM241), winter semester in CHEM104 (5 lab sections), CHEM105(5 lab sections), CHEM140 (4 lab sections), CHEM241 (2 lab sections), along with other labs that we provide TA support to labs based on enrolment need and activities in labs. All of our labs do have dedicated lab instructors.

The BIOC220 lab needs with the 6 lab sections such that we provide TA support

(6 lab sections typically 23 students, and 2 lab section of BIOC321 in fall semester).

Further cuts in TA budgets will also need consideration of our approach in funding graduate students to which we already have an approach of providing TAs for graduate students. This will reduce our ability to be competitive with graduate student total funding amounts relative to other Canadian universities. Potential FGSR could consider adapting scholarship resources available for graduate students to increase the number of GTAs.

Undergraduate Teaching and Learning

As noted in our unit review, reviewers report 2018, " there has been substantial growth in the number of students in service courses over the past 5 years (20%), and even more (over 200%) during the past 10 years. This is an extraordinarily high service load for a department of a modest size and the impact of this growth needs to be addressed."

This need has been addressed with previous increase in faculty complement of 2 compared to the level that we were at during our unit review.

Enrolment in the department continues to be strong and at or near capacity in fall and winter semester based on our lab capacity abilities and faculty complement. Enrolment has been relatively stable at this high capacity limit. With some small enrolment changes it has provided us opportunity for balancing enrolment in courses taught both in fall and winter semester due to either program requirements or service need requirements. CHEM100, CHEM104, and CHEM105 are also offered during the spring/summer semester and these sections reach enrolment targets yearly. During remote delivery during COVID-19 we did see some semesters with higher capacity than when in-person labs due to the labs shifting to remote delivery during this period which would have been beyond our normal lab capacities. All labs have returned to in-person delivery such that enrolment caps also reflect lab capacities. The program is meeting enrolment needs with the courses offered.

CHEM100 Introductory Chemistry -students who don't have 65% in high-school chemistry can meet the pre-requisite requirement with 65% in CHEM100 which is one of the pre-reqs for CHEM104. It is optional for other students.

As noted in our unit review reports we changed the semester of offering of CHEM100 to better meet our program requirements and we have seen an increase in enrolment of 89 in fall 2018 to 112-143 in subsequent years (there is no lab component to this class). Class enrolments are influenced by student grades in high-school chemistry and have remained higher than during the unit review period and the department is meeting demands.

CHEM104 is offered in both fall and winter semester as well as spring/summer. Overall enrolment remains near our capacity limits for labs (See figure below)

CHEM105 is offered only in winter semester (as well as spring/summer) and we balance lab needs for CHEM104 and CHEM105 as these courses are taught in the same room.

We do see fluctuations in CHEM104/105 enrolments from year to year. CHEM105 is taken by a number of major programs in science as well as pre-professional programs. (see Figure below)

Due to on-line delivery during COVID-19 we did increase our enrolment above normal lab capacity in a few labs such as CHEM104, CHEM105, CHEM140 due to remote delivery of labs during this period to meet demand. It should also be noted that the Chemistry & Biochemistry department provided hands-on experience with the use of lab kits for students to use at home and appreciates the support from UR Stores in the distribution of chem kits for CHEM104 and CHEM105.

CHEM140 is offered in fall and winter semester. This course is also required course in Faculty of Engineering and Applied Science and so some reduction in enrolment were expected with enrolment trends in other faculties with enrolments relative stable since fall2019/winter2020.

Over the past years to reduce enrolment pressures particularly for lab capacity in the fall semester we have shifted enrolment more evenly between fall and winter semester. Despite enrolment declines in some programs outside our department enrolment has remained relatively strong and we have decreased number of lab sections in CHEM140 over time to allow for the accommodation of changes in CHEM241 which began in the fall 2021/winter 2022.

CHEM241 In fall 2018 was at 57; fall 2019 74; fall 2020 75; fall2021/winter 2022 52/23; fall 2022/winter 2023 29/47

CHEM241 is a required course for CHEM and BIOC majors and pre-professional programs such as pharmacy so to ensure opportunities for students to complete their programs and requirements we started to offer CHEM241 in fall/winter semesters in 2021/2022. We will continue with offering CHEM241 (Organic Chemistry II) in fall 2023/winter 2024. Overall we have seen steady enrolment.

BIOC220 in fall semester and BIOC221 in winter semester have remained high and relatively constant - steady enrolment with our initial caps on enrolment limits remaining the same. Notably enrolment in BIOC 3rd and 4th year classes that BIOC majors are required to take remains strong.

5. The department should examine their senior course programming and consider structural changes, to reduce the variability of senior courses available to each graduating class.

The department reviewed options and took an approach to design some team-taught courses which were available and did provide new course offerings for students and greater opportunities for faculty to teach at the 4th year level. However, this was difficult to maintain with our faculty complement, and the transition to remote delivery during COVID-19 restrictions and with our needs in high enrolment service courses. In general the department offers 1 CHEM4xx and 1 BIOC4xx course in each of fall and winter semester to meet the requirements of our program. We seek solutions to students needing an additional class in their final year due to their individual circumstances when possible which may also include offering an additional CHEM4xx class (reading style above normal faculty teaching load). Rotation of topics at the CHEM/BIOC4xx level has increased and we rotate faculty member offering this class as much as possible giving some priority to tenure-track members having opportunity to teach at this level. Rotation of 4xx level courses was also impacted by other program needs such as faculty to teach organic chemistry through the retirement of a faculty member and start of a new faculty member.

6. The review committee notes the high impact of the teaching equipment replacement and infrastructure development budget of the Dean of Science, and strongly recommends this funding be continued (Note:this funding is also linked to research equipment)

7. A continued effort to complete teaching lab renewal is recommended.

In our last report we highlighted the critical need for replacement of the 300 MHz NMR which was completed with installation of a new 400 MHz NMR for liquid samples. The department also hired a chemistry faculty member with specialization in solid state NMR. Cory Widdifield received CFI support (co-PIs in Faculty of Engineering and Applied Science) for upgrading the 500 MHz NMR to solid state. There has also been a world-wide shortage of helium and after approval from CFI this underwent a significant change from funding for an upgrade to a new 400 MHz NMR for solid state samples within the funding allocation. As a consequence the department of Chemistry & Biochemistry supported by both the Faculty of Science and Faculty of Engineering and Applied Science is in process of quenching the magnet of the 500 MHz NMR which will be end-of life-time of this aging magnet. The new solid state NMR has gone to tender and we are finalizing the location feasibility in same space as the current 400 MHz NMR (liquid state samples only). This instrument with support both undergraduate and graduate teaching and research opportunities and should be highlight as providing unique new research opportunities for the department and Faculty of Science and Faculty of Engineering and Applied Science. There are few locations with solid-state NMR ability in western Canada.

Special note: by moving to a 400 MHz NMR for solid-state NMR rather than our older magnet from the 500 MHz NMR we are also saving on helium consumption and there has also been a reduction in allocation of helium to universities across North America. This helium shortage and availability will continue to be an issue so it is important for the University to strengthen contracts for helium delivery and pricing as opportunities arise. In future there may be need to also consider helium recovery which the department will seek opportunities for funding support in the future. Co-locating these NMRs if feasible with improve the feasibility of helium recovery in the future.

Graduate Teaching and Learning

The flexibility of offering graduate courses is tied into our CHEM/BIOC4xx offers such that the approach we currently use is to offer one hybrid CHEM/BIOC4xx/8xx class in fall and winter semester and offer additional reading style CHEM/BIOC8xx classes to minimize need in overloading faculty above normal teaching loads and reduce a faculty member's ability to maintain a funded research program which supports both undergraduate and graduate research experiences at the university. Any changes in the style and availability of offerings of the CHEM/BIOC8xx classes needs to be balanced with needs in our undergraduate program delivery. There is no easy solution to this problem but we continue to seek opportunities. We have had a high rate of NSERC Discovery success of our faculty including our two tenure-track assistant professors such that those on regular faculty profile are all funded with our newest member submitting his NSERC Discovery grant this past fall. The department continues to lead and collaborate with other internally and externally to ensure opportunities for funding of major instrumentation is sought. The Faculty of Science also provides new faculty members with graduate student support and start-up funds to ensure development of their research programs and the department appreciated this support.