



OFFICE OF THE PROVOST
AND VICE-PRESIDENT ACADEMIC

vpacad@sfu.ca
www.sfu.ca/vpacademic
TEL: 778.782.3925
FAX: 778.782.5876

8888 University Drive
Burnaby, BC
Canada V5A 1S6

MEMORANDUM

ATTENTION Senate
FROM Wade Parkhouse, Provost and Vice-
President Academic, and Chair, SCUP

DATE December 7, 2022

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RE: External Review Report for the Department of Biological Sciences (SCUP 22-27)

At its meeting on December 7, 2022, SCUP reviewed and approved the Action Plan for the Department of Biological Sciences that resulted from its external review.

The Educational Goals Assessment Plan was reviewed and is attached for the information of Senate.

Motion: That Senate approve the Action Plan for the Department of Biological Sciences that resulted from its external review.

C: T. Williams, M. Silverman, A. Brooks-Wilson

Simon Fraser University
Strand Hall 3000
8888 University Drive
Burnaby BC
Canada V5A 1S6

MEMORANDUM

Attention: Chair of SCUP

From: Wade Parkhouse, Provost and Vice-President, Academic *pro tem*



Re: Faculty of Science: External Review of the Department of Biological Sciences

Date: July 29, 2022

Attached are the External Review Report and the Action Plan for the Department of Biological Sciences. The Educational Goals Assessment Plan is included, for information only, with the Action Plan.

Excerpt from the External Review Report:

"BISC is a collegial department with strong research and teaching. Department members clearly think hard about the mission of the department within the University, and are engaged with the University and wider community. With few exceptions, morale was high among faculty and staff. The undergraduate and graduate curricula are consistent with the goals of a Biology education at Universities across Canada. Undergraduates valued the research and experiential opportunities in their programs, the quality of the in-class teaching, and the welcoming atmosphere maintained by faculty and staff. Graduate students valued the research clusters, and faculty expertise available to them."

Following the site visit, the Report of the External Review Committee* for the Department of Biological Sciences was submitted in May 2022. The Reviewers made a number of recommendations based on the Terms of Reference that were provided to them. Subsequently, a meeting was held with the Dean *pro tem* of the Faculty of Science, the Chair of the Department of Biological Sciences, and the Director of Academic Planning and Quality Assurance (VPA) to consider the recommendations. An Action Plan was prepared taking into consideration the discussion at the meeting and the contents of the External Review Report. The Action Plan has been endorsed by the department and the dean.

Motion:

That SCUP approve and recommend to Senate the Action Plan for the Department of Biological Sciences that resulted from its external review.

*External Review Committee:

Maydianne Andrade, University of Toronto Scarborough (Chair of External Review Committee)
Greg Goss, University of Alberta
Brent Sinclair, Western University
Vance Williams (internal), Simon Fraser University

Attachments:

1. External Review Report (May 2022)
2. Department of Biological Sciences Action Plan
3. Department of Biological Sciences Educational Goals Assessment Plan

cc Michael Silverman, Dean *pro tem*, Faculty of Science
Tony Williams, Chair, Department of Biological Sciences

External Review

Spring 2022

Department of Biological Sciences

Simon Fraser University

Submitted: 11 May 2022

External review team:

Professor Maydianne Andrade, Department of Biological Sciences, University of Toronto Scarborough
Professor Greg Goss, Department of Biological Sciences, University of Alberta
Professor Brent Sinclair, Department of Biology, Western University

Internal advisor:

Professor Vance Williams, Department of Chemistry, Simon Fraser University

Preamble

This document reviews the Department of Biological Sciences at Simon Fraser University according to the Terms of Reference (TOR) received by the review team from the Office of the Vice President, Academic which specifies that *“The Review Committee will assess the Unit and comment on its strengths and weaknesses, and on opportunities for improvement. The Review Committee should make recommendations that address major challenges and opportunities.”* Given this broad mandate, our recommendations include those specific to the items in the TOR, and others related to additional issues clearly important to the success of this department. We provide an overview of alignment between this review the TOR in Appendix 1. Our assessment and recommendations are based on documents provided to the team (Department of Biological Science Self Study and Faculty CV’s [March 2022]; Faculty of Science Academic Plan [2019 – 2023], Biological Sciences Research Funding Report [March 2022]), our review of SFU websites, meetings with faculty, staff, post-doctoral researchers, and students in the department, with leaders of Arts & Science Co-op, and with the SFU executive leadership team during an on-site visit to the Burnaby campus on March 30, 31 and April 1, 2022.

Executive Summary

Broad-based Biology departments (usually called ‘Biological Sciences’ or simply ‘Biology’) are the norm at large public institutions in North America. In older Universities, they may have been amalgamated from other departments (e.g. Zoology and Botany), or re-split along levels-of-organisation lines (e.g. Ecology and Evolution & Cellular and Molecular Biology), with the retention of the full range of Biology sub-disciplines. Biology departments have tremendous value for undergraduates who may not (yet) have a strong basis for specialising, for graduate students, since they allow exposure to a range of disciplines and methods, and for faculty as a ready-made environment for interaction across sub-disciplines. Interaction across subdisciplines in Biology is required for innovative and effective responses to many of the urgent, global problems of our times.

The external evaluators all come from broad biology departments of a similar size (Andrade - University of Toronto Scarborough [UTSC], Sinclair - Western University [WU]) or larger (Goss - University of Alberta [UA]) than SFU's Biological Sciences. Our institutional contexts differ from SFU's - e.g. our institutions all have medical schools - so while comparisons of practices at the department level are easily made, we also drew on our knowledge of appropriate comparator institutions in terms of size ('comprehensive' Universities in the MacLean's rankings, such as Carleton University, Brock University and Concordia University).

The review team enjoyed visiting Biological Sciences (BISC) and appreciates the efforts to make our visit informative. BISC is a collegial department with strong research and teaching. Department members clearly think hard about the mission of the department within the University, and are engaged with the University and wider community. With few exceptions, morale was high among faculty and staff. The undergraduate and graduate curricula are consistent with the goals of a Biology education at Universities across Canada. Undergraduates valued the research and experiential opportunities in their programs, the quality of the in-class teaching, and the welcoming atmosphere maintained by faculty and staff. Graduate students valued the research clusters, and faculty expertise available to them.

The emphasis placed on both research and teaching in department culture was apparent, with good faculty research profiles and operating grant success across the board, along with some areas of national or international profile. Research accomplishments and awards were not restricted to the research faculty, as teaching faculty were also engaged in research and innovations in practice. The department has instituted some effective changes in administrative processes and curriculum following the last review.

As was acknowledged in the self-study, this a critical time for reflection, and intentional decision-making for the Department of Biological Sciences. The review team identified several areas of concern, in addition to areas of strength, that are outlined in this report.

At a high level, the most urgent concerns are related to:

- the decrepit state of the physical space occupied by most of the department,
- gaps in teaching capacity leading to unpredictable course availability for both graduate and undergraduate students,
- unsustainably low stipends for graduate students in combination with unusually long completion times and unrealistic thesis expectations,
- uncertainty in faculty retirement replacements and the related imminent threat to the internationally-distinct Master's of Pest Management program,
- a need to support engagement in large-scale and diversified research grant programs
- Understaffing of management in both laboratory operations and office administration, and understaffing of teaching technicians,
- Lack of visibility of the benefits of majoring in Biological Sciences, linked to an underwhelming external program profile and questions of departmental identity.

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1.0 Undergraduate Programs

1.1 Program Quality

The Department of Biological Sciences offers a major and an honours program in Biological Sciences with three 'streams' of concentration: Cells, Molecules & Physiology (CMP); Ecology, Evolution & Conservation (EEC); and 'Open' (which allows a more flexible degree path than the other two streams). The department also offers minors in Biology and in Environmental Toxicology. The EEC program is accredited by the College of Applied Biologists (BC), which is an asset that provides a path for student employment or additional credentials. BISC enrolment in the majors and honours programs appears to be stable at ~600 students total each year. BISC programs feature a strong core with common required courses for all majors at the first year (2 BISC courses, 6 other science), second year (5 BISC courses, 3 other science) and third year (3 BISC courses) levels. In their 4th year, students must complete 5 upper-division courses. Students' choice of stream determines the other BISC courses they must take to complete their degree. This is a robust structure that ensures students are exposed to core knowledge and techniques across subfields which allows them to identify areas in which they wish to specialize, ensures literacy across the concepts underlying their field of specialization, and facilitates students' shifting between streams if their interests change.

The Department offers 15 laboratory courses, providing important opportunities for experiential learning and skill acquisition in the classroom. This seems to be near the midrange for other broad Biology departments of comparable size of which we are aware (e.g., # of Laboratory courses: UA- 28, WU- 19, and UTSC -12). Laboratory courses are an asset for programs in BISC, since hands-on experience is critically important for advancing student learning goals. Other opportunities for this type of experience (i.e., honours theses and other research-based courses for independent work); while a strong feature of the department, are necessarily available only to a subset of students due to capacity limits. The range of opportunities for hands-on learning should be promoted as a strong feature of a degree in BISC. It does, however, pose challenges in terms of scheduling, staffing, and workload (see [section 1.6](#)).

We had several concerns with the current program structure. First, the program is **relatively rigid** with little room for electives. While this is required for accreditation in EEC, that is not the case in other programs. Related to this is the second concern, that the first two years of an intended BISC major/honours student's degree is **dominated by subjects outside of BISC that may not be essential for students to succeed in Biology as currently practiced**, or to foster an informed approach to a Biology degree. Students expressed their disappointment at this balance- and a desire to learn more Biology during their first year. There are seven required BISC courses in the first two years, which is less than half of the 16 required science courses (including two each of courses in Mathematics, Physics and Chemistry). We note that there is only one Statistics course (which students found useful), but no courses in bioinformatics, computational methods, data science, or related fields. These courses would develop skillsets that are desirable and useful for Biology graduates.

The curriculum map shows where Chemistry, Physics and Math are explicitly or implicitly taught in BISC core courses. While chemistry is part of every course in the core, Physics is covered in 60% of the courses, and Math in only 50%. The high-level overview in that document does not make clear whether these courses depend on student retention of concepts from both required courses in each of those areas. Most of the students we spoke to asserted that they did not use the knowledge acquired in many

of their first-year classes, particularly in their two Math courses, and some faculty also questioned the utility of a two-course requirement.

In our judgement, the programs and streams offered are strong, well structured, and leverage the expertise of faculty within the department to explore both core and novel areas of focus in the biological sciences. However, there is an opportunity to rethink the core, given student concerns around the number and type of pre-requisites, and the value of finding space to add modern methods of analysis. We note that many, but not all, Biology programs elsewhere in Canada do tend to include a heavy core of 'other' sciences, but this may reflect historical practices rather than conscious attention to current utility. Reconsidering this might prove a differentiator for BISC programs. As an example of an alternative, the Biology major at UBC includes only one Physics course and has the option of either a computer science or a data science course¹.

A review of program structure might productively consider ways to ensure programs in BPK (Biomedical Physiology & Kinesiology), MBB (Molecular Biology & Biochemistry), and the School of Environmental Science reinforce each other, rather than overlap. We heard reference to an initiative to create a shared 'Life Sciences' core with the advantage of a shared teaching load. It was unclear to us whether this would be beneficial for BISC given likely variation in what is considered core across these departments and schools.

Recommendation

1. **Reassess the core curriculum**, particularly with respect to courses outside of BISC. Determine whether Math or Physics requirements might be trimmed from the program (e.g. reduced to 1 rather than 2 required courses) to allow more space for either Biology electives or preferably for a BISC-focused course in data science, computer science, and/or bioinformatics.

1.2 Curriculum, Educational Goals & Assessment

BISC has engaged in thoughtful curriculum mapping and evaluation of program goals, informed by the last department review, and by other efforts summarized in the 2019 student learning and curriculum mapping report that was shared with us (this included conclusions reached by an external consultant). We commend the Office of the Chair and the Department's Undergraduate Curriculum Committee (DUCC) for this data-informed approach to their curriculum and course offerings.

The department has made a number of changes since the last review to fill gaps in the curriculum, in response to analyses of data from the BC Baccalaureate Graduates Survey and their own survey data, and in response to their understanding of course bottlenecks. New course development, revision and modernizing of existing courses (including BISC 101), the addition of new courses (like BISC 298) along with major efforts like revising the ECC program to achieve CAB accreditation, have been positive changes. The curriculum map specifies the introduction and reinforcing of goals for skills and content, and shows a systematic learning development across each program.

Now that curriculum changes have been in place for a few years, it would be worthwhile to update the curriculum map and use it as a tool to consider the most productive approach to assessment. Expanding the category 'reinforce' into 'intermediate/developing' and 'advanced/proficient'² should illuminate key courses for the assessment of student mastery of learning goals. Where available, benchmarking using

¹ <https://biologyprogram.sites.olt.ubc.ca/files/2021/10/Maj-BIOL-2021W-1.pdf>

² <https://www.sfu.ca/educationalgoals/define.html>

data from the time prior to changes in the curriculum might be illuminating. The cohorts of honours students each year might also be an 'upper end' benchmark that could be tracked.

Recommendations

1. **Update the department's curriculum map.**
2. **Develop a plan to implement standardized methods of assessing student proficiency** at key points in their programs.

1.3 Strategic Enrolment Management

Enrolment in BISC programs is stable, and the size of the program seems reasonable for a university the size of SFU (~600 in honours/majors, Fig 6.1 in the self study). However, growth is desirable from a budgeting and faculty renewal perspective, and other departments with similar faculty complements do sustain higher program enrolment (e.g., 2nd year and above students in programs for: UW = ~1200 students with 44 faculty; UTSC = ~1100 students with 34 faculty, UA = ~ 2800 students with 64 faculty) The Dean of Science *pro tem* confirmed that BISC currently makes offers to most of the applicants who are qualified to be admitted. Thus, BISC will need to attract more high-quality applicants to increase enrolment.

We did not receive information on plans for strategic enrolment management (SEM). The BISC Undergraduate advisor's role description includes partnering with the Associate Chair Undergraduate for SEM (and some of the new student-service initiatives within the department are consistent with SEM). However, we did not see evidence of coordination of SEM efforts across the Faculty of Science or the institution. Although there was much to be commended in the BISC curriculum, we saw little evidence of strategic coordination with respect to explicitly linking the strengths of the department to student recruitment.

We heard a concern within the department that BISC loses 'market share' of undergraduate enrolment to other life science departments and Faculties. The information available led us to question how faculty recruitment and renewal practices are structured, and whether these practices include central oversight ensuring role clarity both within the Faculty of Science and across Life Science disciplines (also see [section 3.6](#)). This is an important consideration if investment in new positions is aimed at recruiting new students rather than fuelling internal competition for an existing pool of students.

In the end, it should be clear to prospective BISC students how to best pursue their interests in biology at SFU, how they will be supported in their goals, the unique benefits of choosing BISC over other Life Science programs, and of choosing SFU over other institutions. Currently, students seeking to apply to the sciences at SFU are presented with substantial choice. The recruitment website for the sciences (which presumably reflects recruitment approaches to clarifying programs for potential students), lists nine 'headline' programs³ related to the sciences, of which only two are in BISC (and one of those is a minor which enrolls relatively few students – Environmental Toxicology). Although the three BISC program 'streams' are listed in the drop down under Biological Sciences, they are subordinate to the general heading, and possible career paths related to each are not clear. For example, the fact that the EEC program is accredited by the College of Applied Biology is not featured on the primary, secondary, or even tertiary links on the recruitment website--this is a lost opportunity. Moreover, several other 'headline' programs from other units include 'Biology' or related terms in their titles. This may leave students confused about how to pursue their interests. By comparison, the similarly broad-based

³ <https://www.sfu.ca/science/undergraduate-students/prospective-students/programs.html>

department of Physics offers five ‘headline’ programs, each with distinct and clear descriptions. Our assessment and review of the department’s planning documents suggests that the three ‘streams’ through which undergraduates can focus their work within BISC are substantially distinct from ‘headline’ programs offered by other Science departments, but those distinctions do not appear to be illuminated for students.

Working with recruitment and communications to more clearly highlight how a degree in BISC is distinct from other programs (inside and outside SFU) could pay off by deepening the pool of qualified undergraduate applicants. Given that a majority of students are currently in CMP, efforts to attract a new pool of students to EEC may be the most feasible way to increase overall BISC enrolment without outstripping teaching capacity. Prospective students with an interest in EEC may also find an accelerated Master’s program attractive. A side benefit of developing this possibility would be a reduction in the heavy course load for MSc students (see [section 2.2.1](#)).

Recommendations

1. **Convert BISC ‘streams’ into programs and consider developing an accelerated Master’s program in EEC.** This could clarify for undergraduates, at a glance, what a degree in BISC provides, while also streamlining narratives for recruiters. It may also draw a new pool of students into EEC.
2. **Rebrand the ‘open’ stream** with a name that captures the flexibility of the degree in a more compelling way (e.g., ‘Integrative biology’)
3. **Illuminate pathways for students who wish to expand their College of Applied Biologist accreditation outside of BC.** For example, make transparent how students can expand their certification via other Professional certifications (e.g. North-America-wide accreditation bodies like The Wildlife Society)⁴.
4. **Ensure uniquely attractive aspects of program identity are shared regularly with recruitment and communications, and are featured in BISC outreach activities.**

1.4 Student Experience

Undergraduate students we met with universally reported positive, supportive interactions with professors, staff, and technicians in the department. Students were effusive about the range of fulfilling research and lab assistant experiences that were available in the department. Although we note that the students we met were very engaged in departmental activities and might not be a representative sample, it is clear that BISC puts considerable effort into ensuring students have access to curricular research opportunities. For example, through new 2nd year courses for developing foundational research skills, and multiple course-based opportunities to do senior research projects.

We commend the department for the 10% decrease in the time to degree for undergraduates (from 5.7 years in 2016/17 to 5.1 years in 2020/21). The students we met with indicated that the department’s introduction of the ‘**Map My Degree**’ workshop for lower division students (developed in response to the last review) was a valuable addition to student support. Students who take advantage of this workshop create a plan that avoids common challenges to program completion. Together with the widely-praised expertise and empathetic approach of the Undergraduate Advisor, the department leaves students feeling that there is care for their success in completing their programs. Similarly,

⁴ <https://www2.unbc.ca/wildlife-fisheries/tws-wildlife-biologist-certification-unbc-students>

development of the 'Bio-Buddies' peer mentorship program was welcomed by undergraduates, both from the perspective of helping new students and developing the mentorship skills of senior students.

Nevertheless, students were clear that they were **disappointed by unreliable access to upper-level courses**, and this is consistent with the results of the BC Baccalaureate Survey (2020) in which 61% of students had a similar complaint. Graduate students had similar concerns about a dearth of graduate course offerings relative to their expectations (see [section 2.2.1](#)). We identify two issues. First, there seem to be a number of courses that are rarely offered, and so would not be available during a normal 4 to 5 year degree. Second, there were courses that were 'on the books' but had not been offered for a long time. Some of the problems with degree completion may arise from poor planning by students (the students expressing this concern during our meeting acknowledged they had not attended a 'Map My Degree' workshop). The department has moved to a model of publishing the courses that will be offered over the following two years, a welcome change. Nevertheless, it appears that it can still be challenging for students to understand which courses will be available, and to find the senior classes they are seeking.

This problem seems to arise because effective teaching capacity is insufficient to ensure a more frequent rotation of courses. Research faculty teaching loads are identical to other similar departments in biology of which we are aware (e.g., # of 1-semester undergraduate courses/year/faculty member: UofA = 2, Western = 2, UTSC = 2), which recognizes the significant efforts involved in mentoring graduate students and running a research laboratory. **However, the self study reports that nearly 50% of faculty are on reduced teaching to provide time for leadership or other distinctions. This is a very high percentage in our experience.** Moreover, there seems to be no regular practice of replacing teaching and service for faculty members who are seconded or otherwise engaged outside of the department. This is surprising, and essentially penalizes the department for its leadership contribution to the Institution and Community. We were informed that sessional teaching contracts are provided if a core course is affected, but not if the courses are electives. This is insufficient, as the loss of courses at the 3rd and 4th year (and graduate levels) negatively impacts the student experience. Moreover, sessional contracts do not include departmental service (another loss with secondments), and will not always garner appropriate expertise to teach specialized labs or 4th year courses (also see [section 1.6](#)). Although it is beyond the scope of the terms of reference for this review, we highlight that at our institutions, there are standardized practices for compensation to departments when faculty are tapped for leadership roles, and that this support allows departments to deliver their programs without interruptions that negatively impact students.

Recommendations

1. **Audit the course information available to potential students and ongoing students through recruitment and departmental sources, and remove or otherwise indicate those that are no longer, or rarely, offered.**
2. Engage in discussions with the Dean of Science and/or VP Academic to **make clear the operational cost of uncompensated reduced teaching**, seek limited term lecturer positions wherever possible.
3. **Continue the well-received 'Map My Degree' program. Consider offering a follow-up for upper division students who have just declared their program stream.** Given that course offerings are posted 2 years in advance, this may significantly reduce the 1:1 time with the Undergraduate Advisor required for bespoke arrangements, and perhaps lead to additional reductions in the time to degree.

1.5 Co-operative Education & Career prospects

SFU was an early adopter of co-operative education. The program is well developed structurally, and despite a now-competitive landscape, has a good rate of successful placement for BISC students. The programming support for BISC co-op students is excellent, and includes preparatory courses, interview guidance, in-placement assessment and check-ins and post-placement reflection. BISC has one dedicated Co-op coordinator (whose role includes responsibilities in other departments). We were pleased to hear that the office also has formal procedures in place to support students in the event of challenging workplace dynamics or harassment, and that such information is included in procedures for determining whether workplaces are retained as partners.

BISC student engagement in co-op is strong (22% of majors), although just shy of the campus average (27%). The Co-op office has indicated room for growth, estimating an additional 200 students who meet entry requirements do not participate in co-op. However, they also indicate that internal and external competition for placements is high for BISC students.

Increasing student enrolment in co-op and maintaining high placement success may be facilitated by action on issues highlighted elsewhere in this document, including the reported challenges with completing program requirements ([section 1.4](#)). BISC students prefer summer co-op placements, when competition is *most* fierce, partly because it can otherwise be challenging to complete their course requirements in a timely way. While some lower-level core courses are offered in the summer, that may be insufficient to keep a student on track if they opt for fall/winter Co-op placements. As an example, although the summer 2022 course offerings include both 1st year BISC core courses, there is just one of the three required 2nd year courses, and one of the two required 3rd year courses⁵. The Undergraduate Advisor confirmed that 4th year courses are rarely offered in the summer, and this is another challenge. While summer teaching is not possible for some research faculty (e.g., those off-site for field work), for others it might be possible. It may even be preferred if faculty are permitted to ‘stack’ their courses in that one term, leaving the rest of the year more flexible for research. It is our understanding that this is permitted by the collective agreement, but it is rarely allowed for reasons unclear to us.

One of the areas of dissatisfaction for BISC graduates is related to career opportunities, suggesting it would be beneficial to seek ways to increase co-op engagement and link students to career networking opportunities. **We saw little evidence of systematic alumni connections to students or to the department in ways that might support these goals.** The department’s successful practices for supporting in-program students through mentorship and experiential work might be productively extended to include more connections with alumni and post-graduation engagement. This includes material as well as financial support. We see the lack of engagement of alumni as a lost opportunity.

Recommendations

1. **Seek an agreement with University Advancement & Alumni Engagement to create alumni mentorship connections**, which may create networking opportunities for students, and expand co-op placements.
2. **Work with the co-op office to integrate undergraduate workshops or other supports** to advertise the value of the co-op program and explain pathways to access and timely degree completion.

⁵ <http://www.sfu.ca/biology/undergrad/current/courses/summer-2022-course-offerings.html>

3. **Consider ways to expand summer course offerings**, including more core classes, and more 4th year electives, with an eye to supporting a co-op degree path that includes fall/winter work terms (this would also facilitate BISC student access to courses in general).

1.6 Technical and Managerial Support (Laboratories)

As was a theme for most of our meetings in BISC, the laboratory technician team indicated that their work relationships were strong and collaborative, and that they felt respected and valued by other department members, including faculty (particularly the teaching faculty), and the Manager of Laboratory Operations (MLO). The work of the team of technicians is complex, both in terms of technical requirements and scheduling. The heavy emphasis on laboratory courses with hands-on experience in BISC, including the recent addition of 2nd year courses with hands-on research components, is beneficial for students but necessitates a heavy workload for laboratory technicians and the Manager of Laboratory Operations. Biological Sciences at SFU has 8 technicians running 15 laboratory courses, managed by the MLO (who has other diverse responsibilities). In comparison, WU has ~11 staff running their 19 undergraduate laboratories, and UTSC has ~8 running their 12 laboratories. For WU, UA and UTSC, teaching laboratory management includes a Lab Manager (or the equivalent) whose role is related solely to undergraduate teaching laboratories.

We saw a number of issues that we think could use departmental attention.

First, the loss (to retirement) of the head technician position without a replacement left the technicians without ‘on the ground’ support and leadership. Despite the establishment of (well-received) regular meetings with the MLO since the last review, and the general sentiment that they are well-managed, the technicians made clear that the loss was keenly felt.

Second, the MLO’s role is extremely broad, and it is a liability that there is no operational redundancy in staffing for this role. In other institutions, tasks assigned to the MLO at SFU are handled in a more distributed way, or there is a robust intermediate level of employee (which is missing from BISC since the head technician retired). For example, research laboratory needs, including renovations, repairs, health and safety inspections are serviced by facilities management, environmental health and safety, and other office administrative staff at WU and UTSC.

Third was a heavy workload. We were provided with figures that suggest some BISC technicians have multiple simultaneous teaching preparations (laboratory courses) more often than do technicians in other Science departments at SFU (e.g., Chemistry and MBB). This means tight timelines to manage preparations for a wide range of laboratory technical needs, and little time for maintenance, innovation, safety inspections, or development of new materials or activities. The back-to-back nature of the semesters, and the lack of operational redundancy among the technician positions means it is difficult for technicians to take time off without subjecting colleagues to an unmanageable workload. Adding to this challenge is the assignment of sessional instructors to lab courses, which can require additional onboarding work by the technicians. Finally, the increase in the volume and complexity of administrative paperwork required for basic functions like purchasing and petty cash purchases is a poor use of already tightly constrained time (granted, this is a common complaint).

Similarly, the workload for the MLO appears to us to be unsustainably high, including, as it does, responsibility for technicians, teaching labs on the Surrey as well as Burnaby campuses, research labs, and some shared facilities (e.g., greenhouse, research vehicles), and coordination or emergency response to infrastructure failures and repairs. While it seems that some centralized operations support is built into the Office of the Dean, the priority seems to be helping smaller departments that do not

have a stand-alone operations role, so little support is provided to the BISC MLO. The review team was concerned that the heavy workload, including constant crisis management related to regular building floods, may ultimately lead to drift in laboratory safety.

Fourth, scheduling lab courses apparently proceeds without sufficient consideration of the logistics of lab preparation or equipment availability. Our conversations with others suggested that the MLO is not involved in initial discussions about course allocation and scheduling, and so needs to manage those challenges after the fact. The BISC constitution indicates that teaching assignments are based first on teaching needs, and then on the requests of faculty. In general, (lab) course allocation practices do not seem to incorporate practical concerns.

Fifth, there does not appear to be a regular environmental health and safety inspection of teaching laboratories. This seems particularly risky for labs that see high traffic from untrained undergraduates, and we revisit this concern in [section 6.1](#).

Finally, we note the uneven assignment of pay grade levels for technicians in the department, with a perception (confirmed by the MLO) that union regulations privilege some types of expertise over others. This is beyond the scope of our review, but should be addressed.

Recommendations:

1. **Complete a needs assessment and prioritize hiring to support the technical staff and MLO.** We see this as an urgent priority. A replacement for the head technician is one option, but it may be beneficial to consider hiring either an Assistant MLO (or the equivalent) with operations expertise as well as technical skills, or a Lab Manager.
2. **Hire an additional technician or technician assistant who is broadly trained and can provide operational support across undergraduate labs.**
3. **Review the course scheduling process to ensure practical challenges of space and workload are part of the decisions.**
4. **Ensure teaching lab safety is regularly assessed and managed by the department.**

1.7 Teaching faculty

We met with the teaching faculty and were impressed by their level of professionalism and dedication to providing a positive educational experience for BISC undergraduates. The teaching faculty are actively engaged in pedagogical scholarship and research, including presenting at local and national conferences and publishing in pedagogical journals. They are also quite successful at securing grants for their research. We made special note of the high morale of the group and that they felt there were clear lines of communication, support and respect for the teaching faculty within the department. Since the last review, the department has increased the range of ways in which teaching faculty can contribute to department governance, and as a result they feel they have a voice in departmental decisions. Many of the teaching Faculty have won awards (12) for their efforts, and they are a source of teaching and curricular innovations that elevate teaching across the department. Overall, the teaching faculty are excellent and their work yields high levels of student satisfaction.

In general, the teaching faculty were happy with the level of investment in teaching and support for teaching pedagogy. They did raise concerns regarding increased time spent on non-teaching tasks (administration, forms, permits, mandatory training modules) as this has eroded time for course development and professional development. Although such onerous requirements often arise external

to the department, efforts to streamline routine but time-consuming tasks would be beneficial. One key example is the new, mandated procedure for hiring TAs, which requires assessing a much larger number of applications (many below thresholds for subject matter knowledge) than in the past.

Two other concerns are also related to protecting time for renewal and reflection. First, the **late announcements of examination schedules for undergraduate exams make it difficult for teaching faculty to plan for leaves or vacations**, particularly since the semesters have relatively short breaks between sessions. We realize this is a central administration issue, but highlight it here, as it likely impacts others across campus and could be remedied centrally. A related concern is that **the three-semester system at SFU does not provide much time for reflection, professional development, or pedagogical development**. We are concerned that this does not support the work needed to maintain the current (high) level of pedagogical and teaching excellence. Burnout is a risk. This is particularly important for teaching faculty who engage in time consuming service efforts like curriculum mapping, examining the current curriculum to remove EDI barriers, and indigenizing the curriculum-- tasks that tend to fall to relatively few individuals.

Recommendations:

1. **Develop process-improvement mechanisms for dealing with onerous but routine administrative work.** In the case of TA applications, consider ways to assess basic qualifications centrally, and share only qualified applicants with teaching faculty.
2. Ensure that, within the confines of the collective agreement, **teaching faculty are provided with time (course equivalencies) for innovation, course development, EDI and indigenizing of the curriculum.**

2.0 Graduate Programs

Graduate students are the research lifeblood of any biology department in Canada, and BISC is no exception. The graduate students appear to be successful, are active participants in the overall positive atmosphere of the department, and they are driving Equity, Diversity and Inclusion initiatives in the department (also see [section 7.0](#)). Graduate students spoke glowingly of the research groups and the overall intellectual community (pre-pandemic). We were impressed by graduate student leadership in the non-profit sector, and got the impression that graduate students overall are excited by, and invested in, their research. Faculty seemed happy with their graduate students and did not report systemic problems recruiting high quality students.

We were impressed by several University-level aspects of the graduate program. The Office of Graduate and Postdoctoral Studies expresses genuine concern for graduate student welfare, and has functional, graduate-student-focused mental health supports (like all institutions, it sounds like these could benefit from more financial resources). The tuition equivalency for international and domestic students is important for maintaining a thriving outward-looking program, and the stepped reduction in tuition after six or eight semesters (MSc and PhD, respectively) is a good feature of the program.

However, graduate stipends are below poverty-level for living in Burnaby/Vancouver, and expectations for theses appear to be too high relative to other research-intensive institutions.

Together, these conspire to yield eye-wateringly long completion times (an average of 7 years for PhD and more than 3 years for MSc as listed in the Self Study) and an environment where 90% of graduate students receiving the full departmental stipend require additional financial support (outside jobs, loans or familial financial resources) simply to remain in the program. Consequently, when asked directly, senior PhD students said that they would not recommend the graduate program to incoming students.

Our overall impression is that the graduate program requires a substantial shift in departmental culture and expectations to maintain its success.

2.1 Graduate Student Research Quality & Contributions

The self-study document reports a range of recent regional, national, and international awards, honours, and scholarships for graduate students from a broad cross-section of research groups in the department. We were not provided information that allowed us to evaluate the quantity and quality of graduate student research publications, but since publications usually reflect the success in awards etc., we expect that the outputs are appropriate. Graduate students specifically spoke of their thesis chapters in terms of publishable units, which speaks to publication beyond the thesis as a valued research output, as is appropriate for a research-intensive biology department. We do, however, have concerns about the scope of those expectations (see [section 2.2.2](#)).

2.2 Program requirements

In common with most biology programs in Canada, both the MSc and PhD programs require some coursework and a thesis. Our impression is that students perceive insufficient communication regarding the availability of advertised courses. Although the Departmental Graduate Studies Committee (DGSC) provides a list of available courses two years in advance, some students seemed to be referring to courses they had expected when they first entered the program.

We found some disparity in the expectations for a thesis in BISC relative to other departments across Canada with which we are familiar, and noted discrepancies among the reported expectations from different PIs. **We perceive a need to evaluate, codify, and establish accountability for the expectations for the thesis to bring this into line with disciplinary norms in Canada, and to evaluate the coursework requirements relative to course provision.**

2.2.1 Course requirements

Our understanding of the graduate course requirements is laid out in **Table 1**, alongside comparison with our home departments. We appreciate the value of graduate courses, but the required course load seemed to us to be high relative to our institutions, and this high level of coursework (coupled with the infrequent offering of many courses, discussed below) may be contributing to long completion times.

Table 1: Coursework requirements in SFU BISC relative to peer departments at UA, UTSC and WU (all listed as number of one-semester courses). Our understanding is that a one-semester graduate course at SFU is usually worth 3 credits.

Degree	BISC SFU credits (1 semester course equivalents)	UofA	UofT Ecology & Evolutionary Biology (EEB) or Cell & Systems Biology (CSB)	Western U
MSc	12 (4)	2	EEB ^a & CSB: 1 ^b	2
PhD (direct entry from undergrad)	12 (4)	2	EEB: 4 / CSB: 1 ^b	3
PhD (after MSc)	12 (4)	2	EEB: 3 / CSB: 1 ^b	2
PhD (transfer from MSc, total number of courses including MSc)	15 (5)	2	EEB: 4 / CSB: 1 ^b	3

^a16 month program

^bIn addition to seminar series attendance

The department lists an impressive array of graduate courses (especially factoring in courses cross-listed with undergrad and graduate courses in BPK and MBB). However, students found that many of the advertised courses are not actually offered. The students were positive about the value of the orientation course (BISC 800) which we were puzzled to note is only 1 credit hour (possibly making it impossible to reach 12 credits without taking five courses). Several students across different sub-disciplines noted that they felt that there were too few courses available, that they did not feel that faculty prioritise graduate teaching, and that students who were attracted to the program by the course list felt misled. Our understanding is that faculty receive appropriate teaching credit for stand-alone graduate courses, but the challenges the department faces in meeting undergraduate teaching requirements means that there is limited teaching capacity available for graduate courses. Many graduate students indicated that they take undergraduate courses cross-listed at the graduate level, or take courses that are not relevant to their research simply to satisfy program requirements.

The courses offered did not appear to fulfil students' technical or intellectual requirements across the breadth of the department. For example, CMP students noted that there did not seem to be any CMP courses currently offered or planned (we identify one, BISC834 over the current two-year period on the website). CMP faculty in some sub-disciplinary areas reported that graduate courses they offered were often cancelled because of a lack of students, and they were generally concerned about a lack of courses for their students to take. We suspect that this paradox may be resolved through clearer graduate course planning, or by instituting directed studies or team-taught courses that allow graduate students to focus on niche areas within a broader rigorous structure. We also note that there are CMP-related graduate courses available in BPK and MBB. One option might be to explore collaborative graduate programs (e.g., WU's Developmental Biology Program, that includes Biology and several departments in the Medical School⁶). If such an administrative structure is available at SFU, then we suggest it could be a way to formalise graduate-level cooperation between BISC, MBB, and BPK.

Graduate students from across the Department reported that they felt that the statistical and computational training available was inadequate for the demands of their projects. In our experience, it is perfectly normal for graduate students to self-teach the specific skills necessary for their research. We note that BISC869 is now offered annually and should provide the knowledge needed to facilitate that approach. Given that Data Science is a strength at SFU, the department might also explore the possibility of a joint Data Science(s) graduate course covering basic statistical, computational, and bioinformatic skills.

Recommendations:

1. **Evaluate the utility of the graduate program course requirements, and consider options for reducing the load.** For example, the department might add a directed study course, departmental seminar-based courses (as described in the self-study document) or incorporate a practicum or paid internship (Graduate students were very enthusiastic about this idea).
2. **Consider working with other units as appropriate to develop a graduate course in Data Science for the Life Sciences.**
3. **Complete an audit of advertised course offerings** and ensure information available to potential students is clear and up to date (see similar recommendation in [section 1.4](#) for undergraduate courses).

⁶ https://www.schulich.uwo.ca/gradstudies/developmental_biology/

2.2.2 Thesis requirements

We agree with the self study that the completion times for graduate degrees in BISC are too long (this is a problem that pre-dates the current pandemic). One source of these long completion times appears to be a culture of overly-ambitious expectations for the contents of the thesis.

In our experience, the bar across Canada is for an average biology MSc thesis to contain work equivalent to one scientific paper, and an average PhD to contain approximately three 'data chapters', each equivalent to one scientific paper. We recognise that this varies among sub-disciplines, and also that this is the stated expectation in the self-study document. However, both faculty and students reported a culture and norm of planning far more ambitious theses. They explained this meant aiming, from the outset, for a three year MSc thesis and a five year PhD thesis. One faculty member told us that they felt that this ambition was driven by the students wanting more publications to enhance their chances of an academic career, but few-to-none of the students we met with expressed a desire to stay in academia, suggesting this assumption is incorrect.

Clearly, there is variation across the department in terms of faculty and advisory committee messaging about the expectations for a thesis. However, we heard consistently that the current unwritten expectations are setting students up for long theses. We are especially perplexed by overly ambitious MSc theses. We do not understand why students producing three data chapters in as many years are not supported to transfer to the PhD program. Although we note that graduate students appear to be winning awards, the rate of these successes is on a par with equivalent departments with shorter times to degree, so we do not discern an advantage to long programs for BISC students. While there will always be exceptional, highly productive students who far exceed expectations, it is problematic to expect exceptional performance from every student.

We perceived an unexpected comfort with long completion times in the department. We appreciate that Graduate and Postdoctoral Studies is working hard to provide incentives and supports for students to complete their programs, both via the BAS funding formula and other initiatives. However, alongside these carrots, we think there is a need for accountability within the department. Specifically, there is a need for the department to create firmer deadlines and expectations for completion, and to incentivize supervisors to help students finish in a timely fashion.

Recommendations:

1. **Track whether the content of submitted theses aligns with the written guidelines for the graduate program** and ensure this information is communicated to all research faculty at regular intervals.
2. **Create mechanisms to ensure that supervisors, advisory committees, and qualifying examination committees consider proposed work in light of BISC guidelines for timely completion.** The goal should be to support average completion times in line with peer institutions in Canada (a little over 2 years for an MSc and under five years for a PhD student). For example, we suggest that advisory committee members must, at every meeting, answer this question in writing: *'Can this project reasonably be completed within 2 years for an MSc/ 5 years for a PhD?'* This will require a significant change in the culture of the department with respect to expectations of theses.
3. **Increase the required RA contribution of the supervisor to the student stipend beyond a target completion threshold**, or regulate the admission of new students to labs that have multiple students beyond target completion times.

2.2.3 Professional and career development

A majority of graduate students we spoke with were interested in pursuing non-academic careers. We heard that there are relatively few professional development opportunities at the department level for career paths outside of academia.

We were impressed by the involvement of the Department with the initiation and support of non-profits. Senior administrators highlighted the central entrepreneurship supports that might provide additional support to graduate students embarking on this path. Graduate students we met with did not seem to be aware of these resources. Similarly, we learned that entrepreneurial Biology graduate students might take innovation-related programs and courses at the SFU Business School, and there may be mechanisms already in place to offset tuition costs for students who are accepted to participate.

Recommendations

1. **Provide value-added non-academic career development for graduate students.** This could leverage established relationships with industry, government, alumni, and non-profits, and include partnership research, internships, co-ops, and practicums (especially in the professional programs).
2. **Work with central offices to clarify and promote graduate student access to SFU's supports for not-for-profits and entrepreneurial innovation.**
3. **Maintain relationships with graduate students after graduation** to allow assessment of success towards career goals and build a receptive alumni base.

2.3 Funding & Benefits

The cost of living in the lower mainland has been increasing dramatically – we learned that rent has increased by ~20 % in the past six months! It was abundantly clear in all of our discussions that the stipends currently paid have not increased to keep up with cost of living, and that only a handful of graduate students (possibly as low as 10 % of the student body) are getting by on their stipend alone. Graduate funding is an issue at every institution across Canada, and for this reason, some may have habituated to this challenge. However, the current context is different. Vancouver has the highest cost of living in Canada, with the poverty line rapidly moving upwards since the start of the pandemic, and accelerating inflation and current international crises are precipitating long-lasting increases in basic costs. The financial support offered to students in BISC is simply too far below the cost of living, and the poor stipends are at the heart of long completion times and student disgruntlement. Regardless of the graduate stipends paid elsewhere at SFU (to which we are not privy), BISC needs to recognise that their competition is with other Biology programs in Canada, and that the comparison needs to be in terms of stipend:cost of living ratio, not simply the absolute stipend. **We believe that failing to address stipends substantively and urgently will translate into recruitment challenges, declines in research productivity, and consequent significant reputational risk to the BISC graduate program.**

Faculty members agree to pay up to 50% of their student's stipend when they accept them. The 'standard' stipend for MSc and PhD students in the Department is \$24,000/year, combining TAs, competitive Graduate Fellowships, and the supervisor contribution (we address each of these below). Tuition amounts to c. \$6,000/year (and is paid from this stipend). To put this into context, the estimated living wage in the lower mainland (see the self-study document) is >\$34,000/year (also see [section 7.0](#)).

2.3.1 TAs

A substantive portion of graduate stipends (more than 1/3 in many cases) comes from TA activities. This is typical of most biology departments. We understand that many of the parameters surrounding

TAships are determined by the TSSU collective agreement. Our understanding was that most students are happy that the TA expectations do not (normally) exceed the hours allocated, but it was not entirely clear to us whether reports of some expectations above the compensated hours were from past situations that have since been resolved, or reflect the current environment. There are mid-term check-ins to ensure unanticipated hours are compensated.

However, the number of hours expected in a one-semester TAship (210 hours) was almost 50% greater than expected at our institutions (156h at UA, 140h WU and UTSC), for similar money (no variation by degree program: \$8699 at UA, c. \$6600 at WU, \$6700 at UTSC; vs \$7390 for a PhD at SFU). The additional TA commitment for the basic stipend likely contributes to long completion times by reducing time available to work on research.

2.3.2 Graduate Fellowships

The Office of the VP Graduate & Post-doctoral Studies provides departments with BAS funding to support graduate students, with an allocation formula that includes the total number of students in the graduate program and their time to completion. BISC uses these funds primarily to create Graduate fellowships (GFs) whose value and allocation is at the discretion of the department. In BISC, these are currently disbursed at \$7000/student - an amount that covers tuition with some funds left over for a little less than half of the students in the PhD and MSc program. Information from the Chair and the self study indicates that currently a little fewer than 50% of MSc and PhD students receive GF's (in 2020, 42 of 104 PhD and MSc students, and in 2021, 44 of 93 PhD and MSc students). We were told in our meetings that supervisors decrease the total amount they pay for their students' stipends if the student is awarded a GF (so they meet, but do not exceed, the minimum stipend). GF's are apparently awarded based on a combination of need and merit (e.g., students with other fellowships do not receive them, see below). Some faculty seemed disgruntled about a lack of transparency with respect to GF allocation among students in different research areas.

2.3.3 Graduate Funding

It seemed that both the department and individual supervisors were treating the \$24,000 stipend as a ceiling, rather than a minimum. For example, major scholarship holders are restricted from receiving additional funds from TAing, rarely get GF's, and it did not seem that faculty actively top their students' stipends up above the minimum, although some well-funded PIs do buy students out of some TAing.

Students indicated that a minimum stipend of \$30,000/year would allow a modest living, and substantially reduce the need for outside supports. This increase is roughly equivalent to the cost of tuition (c. \$6k/year for the first few terms of programme, according to the self-study document). Such an approach is already taken at other institutions. At WU, a 'Western Graduate Research Fellowship' roughly equivalent to tuition is credited to each graduate student at the start of the term, using funds from the Department's graduate allocation; at UBC, the Faculty of Science covers PhD student tuition (and subsidises MSc students by \$1,000), and at U of T (EEB), a University of Toronto Fellowship, roughly equivalent to the cost of tuition, is provided by the Faculty of Arts & Sciences.

A departmental revision of the approach to allocation of Graduate Fellowships—shifting to an across-the-board contribution to student stipends, would be one way to start addressing the low stipend problem. Such funding should not reduce the supervisor RA contribution. The positive effect of increasing the minimum stipend is likely to leave students with more time to complete their research, however, and together with modifications to course and thesis length requirements, could significantly decrease completion times. Since the BAS formula incorporates completion rates, in the medium term,

an increased completion rate should generate additional funds that would offset the cost of providing a more appropriate stipend. Thus, an initial injection of resources should pay off with a more-sustainable program.

An additional problem is that winners of major scholarships (e.g. NSERC CGS-M or PGS-D), have their stipends topped up to the minimum, but receive no other incentive, and are deprioritised when evaluating applications for Graduate Fellowships and TAs. This is problematic from the perspective of attracting strong students. We suggest that finding ways to provide additional funds to major scholarship winners is essential to facilitate their recruitment, on-time completion, and to allow these exceptional individuals the capacity to reach their scientific potential. There are a range of models available to do this, ranging from Supervisors paying the normal \$11,000 (MSc) or \$9,000 (PhD) contribution from their research grants to scholarship winners, through departmental contributions, to allowing scholarship winners to hold TAs or GFs. As an example, at Western an NSERC PGS-D student still receives the WGRS (see above) and is eligible to TA one term per year, bringing the annual stipend above \$30,000, and many supervisors provide additional top-ups. Similarly, at UT EEB, although the UTF amount is reduced for scholarship winners, there is still a standard award, students can TA for one term, and supervisors and the department top them up as well. BISC should expect scholarship students to make these types of comparisons when they choose a graduate program.

Recommendations

- 1. Increase graduate stipends from \$24,000 to at least \$30,000/year, the equivalent of waiving tuition fees. This is urgent.**
 - The BAS funds could be used to support across-the-board stipend increases to all students rather than GF's to <50% of students
 - The Faculty of Science and Graduate and Postdoctoral Studies could provide matching funds to solve this acute problem, with a timeline for the BISC program returning to self-sufficiency (supported by leveraging the inherent advantages in the BAS funding formula if this change decreases the time to completion).
 - Supervisors may need to contribute additional funds to cover the balance of the increase. Although this might lead to fewer students in any one cohort, a shorter time to degree should increase the rate of turnover and thus maintain the total number of students within the Discovery Grant cycle.
- 2. Determine pathways to provide incentives to attract graduate students with major fellowships.**
- 3. Develop mechanisms for providing reasonable, structured increases in stipends.**
- 4. Ensure that TA duties include all hours that a TA may spend on preparation, related professional development, teaching and communications skills workshops, etc., and thus (within the bounds of the collective agreement) ensure that TA activities are a net benefit for the graduate students.**

2.4 Professional Programs

Biological Sciences hosts two 'professional' programs, the Master's of Environmental Toxicology (MET) and the Master's of Pest Management (MPM). Both enjoy strong external reputations and high success rates placing graduates in careers. Both programs are high quality, and have the potential to be flagship programs that keep BISC and SFU's Faculty of Science on the map in applied biology.

Although the MET is currently healthy, and benefited from some recent investment, we felt it was at risk of losing its way a little, and have some suggestions to correct course and maintain its special identity.

As indicated in the self-study document, the MPM is at a crucial juncture. Although the Faculty of Science Academic Plan (2019 - 2023) specifically commits to promote and reposition the MPM, there is little evidence of investment, and as a result, there has been significant attrition of faculty in this program. We strongly recommend that the Faculty and the University invest to revitalise this internationally-known program, which we think has the potential to be revenue-positive.

It is our understanding that currently the professional Master's programs have the same fee structure as research-based degrees; we wish to emphasize that this is highly unusual on the Canadian landscape. In fact, in our institutions, professional programs in the sciences charge fees that are two to three times higher than research-based programs, and this contributes to the revenue-generating nature of such programs. We suggest that the Faculty of Science revisit the fee structure for professional programs with some urgency.

2.4.1 MET

As described in the self-study document, the MET is a course-based professional program with a research component and an optional co-op. It enjoys a strong reputation and its graduates have enviable employment success. As a professional program, the students ordinarily do not receive a stipend outside their research placement. Thus, the program should be revenue-neutral (or even revenue-positive) for the University. However, the MET students we spoke to did not seem to understand the usual nature of professional programs (no stipend and higher fees). We can see that since their required research projects are largely conducted in BISC labs, and often last longer than one semester, there is likely to be some confusion about the difference between the MET and MPM/MSc. We heard from students that the schedule over which the required courses are offered made it difficult for most students to accumulate the required courses within two years.

The practicum component of this program should be a highlight and facilitate networking and employment. However, although the research component is mandatory and includes a defense, co-op is optional, which is surprising given the applied nature of the degree. The MET students did report that Mitacs-funded internships also occur. It sounds like this emphasis on the research component can be something of a lose-lose situation: students invest more time than required to try to see a project to completion, and faculty are frustrated that these short periods do not yield high quality research outputs. Moreover, this approach is not common for a professional program. Reconsidering the program structure and duration might allow for recruitment of international students and employer-paid upskilling. This could increase enrollment and propel the program into revenue-positive space.

Recommendations

1. **Restructure the program into a 16 to 20-month professional program**, rather than the 9-semester (3 year) program currently in place. This would include reconsidering the emphasis on a laboratory research experience rather than co-op or some other practicum, and add a defined time-limit to this component of the program (one or two semesters).
2. **Maximise employment-ready skills and networking** by focusing as far as possible on non-academic settings for the research/practicum component, making use of Mitacs wherever possible.
3. **Make better use of the broader SFU ecosystem**. For example, we see opportunities for course overlap with MPM (e.g. toxicology, QA/QC and data science courses could all be shared between

the program), Chemistry, and the Faculty of the Environment. In addition, the program could be a clear cornerstone of SFU's developing Agritech Sandbox.

4. **Investigate the potential for a differential fee structure as is appropriate for professional programs.**
5. **Work with advancement and industry partners to support scholarships for needs-independent admission of diverse students into this program.** Although as a professional program, stipends are not the norm, the cost of enrolment can be an EDI barrier. We believe that the MET program has the alumni and industry contacts to generate donations to ensure support for an inclusive and diverse student body.

2.4.2 MPM

The MPM is a globally unique program with a glowing international reputation. Although we identify some issues with the program, we cannot emphasise enough that such recognition is not easily manufactured. Our experience is that universities regularly sink significant resources into new programs in the hope that they will achieve recognition: in the MPM, the reputation is already established, and the University need only invest the necessary resources for its renewal. Specifically, we recommend investing in several faculty positions, and restructuring the program to return to its roots as a professional program.

2.4.2.1 Current state of the MPM

The MPM began as a predominantly coursework-based professional program (similar to the MET, described above) and c. 20 years ago transitioned to a thesis-based structure. The current program looks very similar to a regular MSc in the department (including the long completion times) with some additional coursework.

The MPM currently requires six courses, but has only five faculty contributing to teaching. These faculty also have undergraduate teaching responsibilities. As a result, not all MPM courses are regularly taught (students reported that they felt misled by the courses on the website vs. those actually offered), and some courses that we would consider key to a pest management background (such as Integrated Pest Management) have not been taught for some time. Students reported that courses offered lacked employment-relevant content. The summer field courses are a cornerstone of the training that has brought the MPM such renown, but with a single faculty member responsible for them, the scope of this component has been eroded (and affected further by covid) such that a component that was once months long is now less than three weeks. One recently-employed student reported to us that they did not feel the program provided the broad 'pest management' knowledge they needed in their job. In our opinion, this erosion of core competencies in the program is not a fault of the existing faculty, but instead reflects a lack of investment in the program by the University such that five individuals are attempting to run a program whose reputation was built on a program with 14 faculty.

The MPM thesis component appears no different from the BISC MSc thesis, and all of our comments about thesis structure and expectations described above for the MET apply to the MPM as well. Almost all of the current MPM students we spoke with are in one lab, and are clearly enjoying the experience, but this made it very hard to separate unique features of the MPM from the mentoring of one faculty member. The students we spoke to were defensive of the inclusion of the thesis in the MPM, but the arguments they made seemed to be more of an argument in favour of a research-based MSc than for the program as a professional degree, and this is borne out by MPM students often transferring to the PhD program.

Students did not report having access to practicums or co-op placements, and did not feel that the MPM gave them substantive networking opportunities in their job hunt, either via local employers or alumni. Thus, although the program still enjoys a sterling reputation, students attracted to the ‘pest management’ aspect appear somewhat disappointed.

2.4.2.2 The MPM is an extraordinary opportunity for SFU

In our opinion, there is still time for SFU to leverage the strong reputation of the MPM program and rebuild it with relatively little investment compared to building a program from scratch. Some important strengths of the program include:

- An extensive regional community of employers (and potential employers) and global community of alumni could provide a basis for raising endowment and scholarship funds. We suggest that the program could explore a naming opportunity with potential large donors.
- Significant opportunity to leverage the reputation of the program to recruit students from Asia, and the possibility of developing agreements with governments and NGOs in the Global South where the expertise imparted by an MPM program is in high demand in the agricultural sectors.
- We expect that there may be a market for industry wishing to upskill their employees (i.e. in the vein of executive MBA-type programs).

While we provide our suggestions here and in the succeeding sections, **we strongly recommend that the Faculty of Science undertake a market/employer survey.** This will provide some clarity on the areas in which to hire faculty (see [also section 2.5.2.3](#)), the areas in which to focus the program, recruitment markets (both domestic and international), and the key skills employers seek. Key areas of expertise could include agricultural entomology, forest entomology, phytopathology, weed biocontrol and insect biocontrol. As part of this assessment, we recommend exploring micro credentials and/or industry-standard certifications that could be associated with the program.

The MPM would be best able to leverage its unique character if it were to return to its roots as a professional program, including a significant field training component and a practicum. Like the MET, there would be no requirement for a stipend (but our comments about raising money for scholarships applies doubly to the MPM), meaning that it should be possible for the program to be revenue-positive in the medium term. We do not think that our proposal to shift to a professional-focused program will impact faculty research programs, because students who wish to do research on pest management will still be able to work with faculty as presently under the auspices of the MSc, and presumably to access MPM courses to fulfill their MSc course requirements. Although we expect that some MPM students may still conduct practicums in faculty labs, the large base of local employers means that a majority will likely gain their practical experience outside the University.

The MPM is well poised to leverage institutional and regional strengths. Faculty in BISC who currently view themselves as ‘non-MPM’ may be able to contribute meaningfully to teaching in (e.g.) population biology, invasion biology, and ecology in general; we also see opportunity for overlap in some core courses with the MET (specifically: toxicology, QA/QC, and data science). We envisage potential contributions from faculty in Chemistry and Environmental Science, guest appearances from alumni, and the MPM could be a cornerstone of the developing Agritech Sandbox. In fact, although the MPM should be housed in BISC, we could imagine it being elevated to Institute level in the future.

Recommendation

1. Restructure **the MPM to become a 20 month, largely coursework-based professional degree** with substantive field-based training and practicums emphasizing external opportunities for networking and learning.
2. **Investigate the potential for a differential fee structure as is appropriate for professional programs.**
3. **Work with advancement and industry partners to support scholarships for needs-independent admission of diverse students into this program.** Although as a professional program, stipends are not the norm, the cost of enrolment can be an EDI barrier. We believe that the MET program has the alumni and industry contacts to generate donations to ensure support for an inclusive and diverse student body.

2.4.2.3 Resources required to revitalise the MPM

The five faculty members currently involved in the MPM are senior faculty, from a cohort which is reaching 'normal retirement age'. One of those positions (the Finlayson Endowed Chair in Biological Control) is guaranteed to be replaced, and is the only MPM-related position listed in the 'wish list' of faculty hires in the self-study document. Retaining this globally renowned program would require SFU commitment to hiring of both faculty and support staff. Our recommendations could be budget-neutral initially if the institution commits to retention of current MPM faculty salary lines within the department, with flexibility for redeployment. We note, as above, this program has the potential to become revenue-positive, which could provide additional resources to the department and the Faculty of Science.

Recommendations

1. **Retain at least three research faculty positions within the MPM, one of which would be the Finlayson Endowed Chair in Biological Control.** We believe that this number is the minimum required to retain the program's credibility
2. **Hire two teaching faculty** who not only contribute to some classroom courses, but lead a sustained, skills-focused cornerstone field experience
3. **Hire a program coordinator**, who could work with Co-op staff to manage the practicum/co-op placement component of the program. This individual could work with both the MPM and MET, or be partly seconded to the Co-op office.

3.0 Research

3.1 Research Profile & reputation

The BISC self-study report and our discussions with administration revealed a significant *internal* perception that the BISC research profile was declining and perhaps even facing a crisis. This perception appears closely related to the exceptionally poor state of BISC's physical infrastructure. The poor state of the building has created a perception that the department itself is in decline, likely exacerbated by internal competing units within the University housed in notably nicer facilities. Internally, there is competition for student recruitment into newer and somewhat overlapping Faculties and Departments with similar but still distinct academic foci such as MBB, BPK, the Faculty of Health Sciences and Faculty of Environment. Moreover, relatively static undergraduate enrollment has created concerns internally regarding BISC. We got the impression that the Dept of Biological Sciences has suffered a significant

internal reputational loss among the upper administration. This was often framed as being initiated by a previous Dean of Science who did not recognize the strengths and value of a broad Biological Sciences department. These negative perceptions continue despite some very obvious strengths and high *external* reputation for BISC.

BISC has a strong external reputation with research quality and funding that compares favourably to similarly-sized and -funded Universities across Canada (such as Brock, Carleton, and Concordia). Notwithstanding the poor state of the building infrastructure and the need to significantly upgrade the facilities, particular strengths of department are long-standing. Especially important are the strong, unique relationships between researchers and numerous Governmental and Environmental organizations including the Department of Fisheries and Oceans, Canadian Wildlife Service/Environment and Climate Change Canada, as well as other Federal and Provincial government agencies and numerous NGOs. Many of these funding/research relationships are coupled to the MET and MPM programs, which have excellent National and International profiles respectively, are in high demand from graduate students, and have excellent student placement results.

Nevertheless, we do see some trends in external research profile that could use rectification to help BISC maintain or enhance its internal and external status. Given the reputation of some of the excellent mid-career and senior researchers in BISC, we were surprised to see relatively little leadership of large National or International grants and research efforts. This was also noted in the previous external review in 2013 and we did not see a substantial improvement during this review period. Some clear leaders have 100 % teaching buyout and are seconded to perform their work external to BISC. Consequently, some national research leaders are not integrated members of the Department, and are thus ineffective at attracting and training undergraduate and graduate students.

3.2 Research faculty

The BISC research faculty are active and productive (~ 600 papers over the past 5 years for ~ 32 funded researchers). Several researchers have excellent National and International reputations, and citation metrics for these ~10 individuals are good (*h* index > 40). We note that many faculty members rely solely on NSERC Discovery Grants for their (smaller) research programs. Given the increasing competitiveness, flat funding, inflationary pressure on NSERC Discovery Grants, and the need to improve student stipends, this places a direct threat to the Dept writ large – depending on a single funding mechanism is a riskier strategy than in the past.

There are two distinct groups in BISC, largely defined by teaching (CMP and EEC), but we did not see a cohesive research vision within each group, or across the department. The research faculty we met were strongly committed to BISC, despite the competition that is present around hiring priorities (as is common in all academic departments). Faculty noted that that much future planning has been framed on “replacement teaching” for various programs rather than building on existing research strengths or supporting cross-disciplinary research. Overall, the strategic plan for recruitment has been restricted by the paucity of hiring (only 4 Faculty hired over 7 years) and the necessity to fill gaps for undergraduate teaching, making it seem like BISC is always behind in planning. We perceive that the department cannot plan effectively because it has not been given transparent information about faculty renewal or expansion.

The BISC self-study outlines 5 priority replacements over the next few years, a list that was developed with input from the department, and this is an excellent starting point, but it is not part of a clear strategic vision. Moreover, approximately 1/3 of the department is approaching ‘normal retirement age’

over the next 5 years, so BISC should plan for additional opportunities for renewal, and refocusing, with a view to enhancing BISC's external reputation, and increasing the diversity of the faculty (see [section 7.0](#)).

3.3 Funding & Partnerships

Funding success for the research faculty is strong, with > 85% of the Faculty having NSERC Discovery Grants (above the National average for comprehensive Universities) and an average grant size ~\$41K (consistent with national averages).

While ~92% of the research Faculty have some level of external funding to support students, for most faculty, this does not include large operating grants. While there is extensive funding and collaborative research with Government and NGOs, we noted only a few examples of direct industrial partnerships, relatively few MITACS awards, and few NSERC Partnership grants, focused in only a few labs. We foresee a clash between the urgent need to increase graduate student stipends and an over-reliance on systemically stagnant NSERC DGs. Thus, BISC faculty would benefit from increasing their secondary funding wherever possible. This requires a mechanism to decouple increased research funding from increased administrative workload. Although not within BISC's purview, we were pleased to hear about the introduction of a firm University policy of requiring overhead on non-tri-council grants (which is now in progress in the office of the VP Research). This should be coupled to a transparent return of overheads to the department and the PI. This is not specific to BISC, but will benefit the department and incentivise a diverse funding base.

3.4 Research clusters

There are several research clusters in BISC, including the E2O group, the Centre for Wildlife Ecology, eBERG and the Crawford Laboratory, and faculty associated with the MET and MPM programs. Each of these clusters has a long history and the members of these groups tend to be well-funded, and have more graduate students compared to those not affiliated with a group. We believe that these research clusters enhance institutional reputation and are an opportunity to foster leadership in research and teaching, and adding value to graduate and undergraduate research training. It appeared to us that the majority of the members of these groups were happy to be situated in BISC, and we detected little indication that individuals or groups desire to move beyond BISC. This is an absolute positive. Faculty seemed committed to renewal and the betterment of the department. According to the self-study, faculty in Cell and Molecular Biology, Developmental Biology and Physiology have not self-organised into formal research clusters, which may be a missed opportunity.

When renewal of the research space or movement to another renovated research space is finally accomplished (hopefully sooner rather than later), efforts should be made to ensure that **these groups are supported in the physical space in ways that support their collaborative approaches**. (see [section 6.2](#)).

3.5 Post-doctoral fellows

We met with four of the 19 BISC PDFs reported in the self-study document. These PDFs seemed happy with their opportunities and the work environment, and raised only a few issues. They were aware of the poor state of the building which they acknowledged created a negative tone for their first impressions but since 3 of the 4 PDFs we met with were in recently renovated space, the concern was not shared by all.

One significant issue of concern, outside the scope of this review, is the status of externally funded PDFs (e.g., NSERC PDF recipients etc.) within the University. In contrast to PDFs supported from research grants, we heard that externally funded PDFs are not considered “employees” and do not receive basic benefits such as transit subsidies, use of campus facilities, and basic health and dental access. etc. This may also raise potential issues with health and safety liabilities for the University (i.e., WorkSafeBC BC requirements). Attracting externally funded PDFs is a hallmark of well-functioning research programs. The current policy creates a negative impression and likely impairs PDF recruitment, not to mention devaluing PDF contributions to the department. We recognise that this is not a departmental matter, but **suggest central attention to the treatment of PDFs at SFU would be beneficial across the institution.**

3.6 Complement Planning & Retirement replacements

There exists a significant opportunity for renewal in BISC, given that about one-third of the research faculty were hired in cohorts approaching the ‘normal retirement age’. Periods of faculty turnover are key times when a clear long-term vision for the department is important. This also provides an important, and rare opportunity to diversify the faculty through new recruits (see [section 7.0](#)).

Given that only four research faculty positions have been created in the last 7 years, there is, and will continue to be, a significant gap in mid-career mentors to support junior faculty. The new faculty we spoke to were positive about their experience in the department, which they found supportive and welcoming. They appreciated the ‘two pronged’ mentorship program that included both a teaching and a research mentor (initiated by the former Chair), and suggested this would be a good time to review and codify the program. Although colleagues were helpful, they suggested more attention to ‘onboarding’ resources would have saved them a lot of time, particularly if those resources were available online, on demand. Some of the processes for which they were seeking support are central, but some need to be provided by the department (e.g., specification of how GF’s are distributed).

Past hiring and plans for future hiring appear to be driven by teaching needs. While teaching capacity is important, we emphasize that teaching 3rd and 4th year courses that focus on cutting-edge topics requires hiring based on innovative research agendas. We strongly suggest moving beyond like-for-like to a strategic hiring plan that focuses on a vision for BISC over the next 10-20 years (such as the organismal biology focus outlined in the self-study document). For example, although the future vision for the department includes One Health, One Health does not appear specifically in the hiring priorities. Prioritising innovative, cutting edge research will attract undergraduate and graduate students in the long term.

Recommendations

1. **Establish a mechanism to better support research leaders in applying for, and administering, large scale national or international leadership grants.** This may include partial administrative support for grants writing and management at the department, Faculty of Science, VP Research or Faculty of Science level to offset the administrative burdens for training, certifications, permissions etc. This is an essential element to enhance of the reputation of the department Biological Sciences Dept and could be a relatively quick “win”. Also see recommendations in [section 4.0](#)--an Associate Chair Research could provide internal leadership for these changes.
2. **Develop mechanisms to incentivise application to Non-DG funding sources.**
3. **Review the new faculty mentorship program and onboarding resources.**
4. **Hold a retreat to identify and further delineate the long term research foci of the department and develop a cohesive strategic plan for renewal.** This planning should be focused on taking

advantage of opportunities for national and international leadership that exist within the faculty, enhancing existing research strengths and research cluster activity and profile, and avoiding overlap and competition with MBB in the Health sciences or the Faculty of Environment. We comment below ([section 8.0](#)) on the documents arising from the last retreat regarding the identity of BISC.

5. **Ensure faculty renewal plans are driven by research priorities** (with the exception of professional programs).

4.0 Departmental Administration

4.1 BISC Academic administration and governance

BISC academic leadership includes the Chair and an Associate Chair who is primarily active in Undergraduate affairs. Many departments of this size have more than one Associate Chair. Typically, in addition to the Associate Chair Undergraduate there is also an Associate Chair Research (UA, WU, UTSC), and an Associate Chair Graduate Studies (UA, WU and UT EEB/CSB). This structure creates an executive committee, builds in leadership development and succession planning, and can relieve the Chair of some operational duties. While the Chair of the BISC Graduate Studies committee may essentially fill the role of an Associate Chair Graduate studies, BISC does not have any equivalent of an Associate Chair Research in the departmental structure. The person in this role would normally be responsible for internal and external award nominations, supporting and encouraging collaborative grants or other funding opportunities, acting as a mentor/advisor to research faculty, organizing internal grant review processes, and assessing and advocating for research needs.

4.2 Office administrative staff

The BISC office staff, in addition to the Manager of Laboratory Operations (see Section 2.2.4) and the Undergraduate Advisor, includes clerical and secretarial staff (6 people, 5.5 FTE) who report to the Manager of Administrative Service (MAS).

The Undergraduate Advisor is a part-time role (~0.83) providing support to students navigating their degree. The students we spoke with all indicated their gratitude for assistance from the Undergraduate Advisor. The advisor is involved in course planning, and can provide solid guidance to students. Two innovations led by the Undergraduate Advisor since the last review include the 'Bio Buddies' peer-to-peer mentorship program, and 'Map My Degree' workshop. Both of these have been very well received by undergraduates.

The MAS role includes oversight of operating, research/grant, and teaching budgets, faculty expense reports, sessional and TA appointments, administration of University policy and collective agreements, contributions to strategic planning, and process improvement, among other diverse responsibilities. The MAS has a significant workload and broad responsibilities, with no apparent back-up. As a result, the review team learned, it has not been possible for the MAS to truly take time away for vacations, or even sick days without being 'on call'. Not surprisingly, there is very little time to innovate, fully support direct reports, or to be proactive in the work. While the office staff are very collegial, reported a positive work environment, and felt well managed, the MAS workload may eventually have a negative effect on these dynamics. Moreover, given the lack of time for all but the operational pieces, it is perhaps not surprising that there is apparently no annual performance review or goal setting processes for staff, which may limit their professional development. By comparison, WU and UTSC each have two people performing these duties, separating HR and financial responsibilities, dividing other responsibilities, and providing operational redundancy.

There was a deep concern among the office staff about the downloading of duties from central University offices to departmental staff, including imminent changes to financial grant management, such that compliance, funding availability, and managing award terms will now be the responsibility of department staff. To accommodate this change, which does not appear to come with additional resources, the MAS has worked with staff to shift some job descriptions and expand the roles for which some of the staff are trained. Other changes in procedures may improve as familiarity with new online systems increase. **However, without an increase in support for the ongoing work of the department, managing grant compliance in particular may be challenging, with the potential for significant negative impacts on the department (and potentially, the University).**

Recommendations

1. Reconsider the academic leadership structure of the department and evaluate the utility of an Associate Chair Research position. This position would support the recommendations in section 5.0

2. Complete a needs assessment and prioritize hiring a new position to support the MAS. For example, an Assistant Manager could take on many of the routine, but time-consuming tasks of the MAS role, as well as providing some operational redundancy. In our departments, there is a dedicated, high-level financial staff position (a management position), which is supported by a financial assistant. Other administrative tasks are then managed by an equivalent of the MAS (but without the additional requirement for budget compliance oversight).

5.0 Working relationships

5.1 Within the Unit

We met with several groups representing a broad diversity of personnel within BISC. We were very pleased at the level of collegiality and support for maintaining the working relationships within the department. Everybody noted that they felt respected by other groups within the department. This included the support staff, teaching staff, students, PDFs, and members of the Faculty across multiple disciplines. While each group had its own challenges, they all felt that there was a good level of cooperation and communication within the Unit.

Intra-departmental decision-making appears to be reasonably well communicated to the members of the department, with some exceptions noted elsewhere about GF distribution. Our only suggestion can be to ensure that the collegiality continues, even as difficult decisions are made about the most strategic areas for investment, or for faculty renewal.

Recommendation:

1. Establish regular, open (virtual) Q and A sessions with the Chair as an adjunct to formal faculty meetings. This could maintain and improve two-way communication within the department, and support new faculty.

5.2 Within the University

We noted a disconnect between BISC challenges, opportunities, and plans, and plans at the level of the Faculty of Science and the University. We suspect that this indicates a failure of communication between the University administration and the department. Indeed, we heard that communication between the upper administration and BISC has diminished in recent years. There was obviously a rift in communications between the department and a previous Dean, and while the current Dean *pro tem* is from BISC, **it is important that the Faculty and upper administration re-establish consistent open, consultative, and respectful two-way communication with BISC.** It seemed to us that recent decisions

regarding long-awaited improvements in BISC's infrastructure, and cancellation of a recent search, are irritants in the relationship that must be overcome. It appears that the reasons for these decisions have not been well communicated to the department, and we perceived a lack of trust regarding any new plans. We recognize that SFU has grown from a smaller, collegial University into a larger University with multiple campuses. Moreover, there appears to be a concern that the potential for a Medical school and additional competing programs may siphon off resources and prevent/delay renewal of BISC infrastructure. The lack of clear commitments, or even some framing of future possibilities from higher levels of leadership makes it virtually impossible for BISC to plan effectively to strengthen or grow its programs.

Specifically, we were surprised that there does not appear to be a formal annual process for the communication and discussion of budget requests from the department to the Faculty of Science, or at least not one that makes clear to the department what types of priorities are likely to be funded. In the absence of such clarity, planning becomes a futile exercise, or at best, a guessing game.

We strongly recommend that the Dean and Associate Deans establish mechanisms for periodic meetings with the BISC department administration to discuss departmental challenges and opportunities and how these relate to the yearly budget request. Such meetings could establish transparent communication channels that would improve understanding of the department's priorities in the Office of the Dean, and the University's priorities within the department.

5.3 With Communities

Unfortunately, we did not get much opportunity to observe the level of communication between BISC and the wider community. The self-study document reports that BISC research is communicated to outside audiences through conventional and social media channels, and outreach initiatives. These efforts contribute to the reputation of the department locally, nationally, and internationally and may also be key to student recruitment.

There is room for improvement in communication to external communities by fostering better Alumni connections to BISC (as outlined elsewhere in this review). We see an urgent need for senior academics to mentor junior faculty in how to work with existing partnerships but also how to establish new working relationships with local alumni, companies, and governmental departments. This is essential for the future health of the department.

6.0 Infrastructure & facilities

The infrastructure issues that BISC faces are well-documented, and (as far as we can tell) the descriptions in the self-study document, and also in the previous review, are accurate. A few laboratories are housed in the South Science Building (SSB), where the facilities appear excellent (and where there are an astonishing number of eye-wash/safety showers). A majority of BISC facilities are in the Shrum Science Centre (SSC), which is antiquated, has apparently had few updates since construction, and in which damaging floods are a regular occurrence. Addressing these poor facilities was identified as a key priority in the last external review (2013), yet SFU has done nothing about it. We were told about plans for a proposed Life Sciences Building (a complete misnomer, given the exclusion of BISC), and how that would (eventually) free up space for BISC swing space and renovations. However, none of the timelines we heard included meaningful improvement of BISC space in the next 5-8 years. Furthermore, plans, such as they are, do not appear to have been communicated to the Department as a formal commitment. We understand financial and other challenges with building and renovation on the SFU campus. However, **the SFU administration was alerted to a clear, urgent priority that comes**

with significant health & safety risks, and insurance costs, in 2009. To date, no concrete plan to address these issues has been communicated to the unit. Frankly, the idea that BISC, which has been in substandard space for more than a decade (while other departments have moved into new space), is worthy only of leftovers from units that move to a new building at some undefined point in the future sends a strong message that this department is not valued by SFU.

We are concerned about the safety of the facilities and practices in BISC, and perhaps the institution as a whole. The infrastructure in SSC fails to meet many basic safety standards. We specifically asked many individuals whether they 'felt safe', and they did – considering the facilities issues to be primarily a problem for operations and equipment. However, we could glean little information about safety inspections and practices, and were concerned by what we saw in the labs we visited.

It is not an exaggeration to say that we are deeply concerned that the combination of poor infrastructure and lax safety practices exposes the department and the institution to significant risk of accidents causing injury, death, and/or catastrophic building damage.

6.1 Workplace Health & Safety

As has been well-documented, the SSC is in urgent need of renovation and is unfit for the activities of BISC researchers. While we understand that long-term structural issues are challenging to fix, we were surprised that **none of the administrators we spoke to expressed either concern about, or a concrete plan to mitigate, exposure of BISC personnel to environmental hazards such as asbestos, lead-based paint and mould.** Normally, such hazards pose limited risks if undisturbed, but regular floods and other infrastructure failure elevates the likelihood of exposure.

On our tour of BISC facilities, we noted many infrastructure features that we expect do not meet laboratory safety codes, and that we expect put the building at risk of fire. Specifically, there does not appear to be a sprinkler system in SSC, circuit breakers are positioned inside laboratories, benches in labs that have not been renovated have exposed wood (a fire and chemical contamination hazard) and we saw wooden-framed fume hoods best fit for museum display. We were surprised to see little apparent compensation for these safety concerns. On our tour of the lab facilities, we also saw behavioural practices that would be unacceptable from a safety perspective at our home institutions. Much of this comes from the clutter accumulated from decades of continuous lab occupation, but we saw equipment and boxes obscuring routes of egress, access to safety showers, and eyewashes, and student desks placed in laboratories.

Workplace safety at SFU appears to be the prerogative of the Faculty of Science, and implementation appears to fall to the (already overcommitted) Manager of Laboratory Operations. We heard that there is no formal process for laboratory inspections and follow-ups, and that whatever inspections there were did not formally include University or Union participants. There are very real risks associated with dilapidated infrastructure and we are concerned that the lack of inspection risks accidents for which the institution and individual PIs may well be held responsible.

Recommendations

1. **A formal environmental health and safety evaluation should detail the level of exposure to, and risk from, infrastructure-related environmental health concerns and make an acute plan to mitigate any risks within the next year. This is urgent.**
2. **A combined effort of the Institution with the Unions, Faculties and Departments establish a formal safety inspection and follow-up structure.** We note that this downloads additional work

to already-overstretched technical staff in the Department, and that this must be considered when evaluating the staff complement.

6.2 Research space

We viewed research laboratories in SSC and SSB. We were overall impressed by the size of the research laboratories and found the structure and layout to be appropriate for the work conducted. However, as we described above, the infrastructure itself is outdated and unsafe in many instances in SSC. Renovated labs in SSC are perfectly adequate for the work performed. However, even these renovated labs are under constant risk of flooding and other damage from infrastructure failure, diminishing the returns on the amount spent on renovation and meaning that any upgrades should be viewed only as temporary stopgaps and are, in the long run, a poor use of funds. The lab facilities in SSB appear excellent and fit-for-purpose.

We also viewed a shared space occupied by the Centre for Wildlife Ecology. This recently-renovated space housed students and postdocs and had some shared meeting and coffee-making space. We believe that housing individuals from diverse (but broadly related) groups together builds community and is likely partly responsible for the success of some of the research clusters in the department.

Recommendation

- 1. New or renovated space for BISC should accommodate communal facilities for research clusters.**

6.3 Teaching space

We viewed a number of recently-renovated teaching laboratories. The labs are well-designed and thought out and appear excellent for the purpose. Unfortunately, this excellent space is also under constant risk of floods and other damage from the crumbling infrastructure, so we consider these spaces to be excellent, but temporary.

Recommendation

- 1. As with previous reviews, we highlight the urgent importance of creating and sharing a concrete plan for providing suitable research and teaching space for BISC in the near future.**

7.0 Equity, Diversity, Inclusion & Indigenization

The review committee recommends that the central administration at SFU considers explicitly adding Equity, Diversity, Inclusion, and Indigeneity as one of the focal areas in the terms of reference for external reviews.

SFU has a diverse student body and sits in one of Canada's more diverse cities. However, as acknowledged in the self-study document, faculty and graduate student demographics do not reflect undergraduate demographics, nor the demographics of the wider community. Apparent representation (e.g., of women, Indigenous people, and racially visible people) is below average relative to other Canadian post-secondary institutions.

The graduate student caucus should be commended for their work on equity, including fundraising for SFU's first Black & Indigenous student scholarship. Similarly, the department is to be commended for revising career review criteria to explicitly include credit for EDI work, and for striking an EDI committee. We also heard that one faculty member has expertise in, and is seeking to develop an approach to Indigenization of the curriculum. While this is good news, meaningful change will require broader

engagement and resourcing at the level of the department. The development of actionable goals, and a pathway to achieve those goals, is necessary.

We believe that the first step to equity in the graduate student body is to increase stipends and decrease completion times. Together these will remove some significant barriers for the participation of diverse individuals, many of whom may not have the personal or familial financial resources to survive on current stipends.

A significant area of opportunity for advancing EDI is through new faculty recruitment, which can have positive effects across all of the department's activities. The initiatives of the Faculty of Science to ensure search committee members are educated in bias and equity are a reasonable start to adjusting processes to support inclusion, but even this rudimentary start will fall flat without departmental engagement in seeking and supporting diverse applicants. The faculty complement can only be diversified through hiring, and given the approaching wave of faculty renewal for BISC, this is a critical time for the department to establish plans for inclusive recruitment. We were surprised that there is no mention of this opportunity in the self study, nor is there any indication of how equity concerns will factor into processes for faculty hiring. Reversing the under-representation of employment equity groups among the faculty will require the University to commit to replacing retiring faculty in BISC, and active attention and action by the department to follow recommended practices to attract, recruit, retain, and support scholars from under-represented groups. This work should start now, and it must reach beyond the EDI committee to encompass all department activities.

Recommendations

1. **Develop an EDI action plan that reaches across department functions, and does not depend solely on the EDI committee.**
2. **Accelerate adoption of best practices for inclusive recruitment**, including hosting talks or workshops within the department, developing relationships with scholarly affinity groups, and with societies that include biologists of diverse identities.

8.0 Future plans

BISC has been under decadal pressure to differentiate itself from other Life Sciences departments within SFU. In response, it has identified a distinct unifying focus on functional links from sub-organismal to ecosystem levels and global change. We agree that this is an appropriate description of the *scope* of the department, and that it distinguishes BISC from other SFU units. This approach also allows the department to encompass emerging interdisciplinary directions such as One Health. Although this focus defines the scope of the department, we do not feel that it provides a *vision* that guides strategic development. One consequence is that hiring priorities remain strongly influenced by perceived teaching needs rather than research strategy. **Beyond this general comment, it is challenging to assess BISC future plans as presented in the self study document because decisions about future goals will necessarily depend on the types of resources and supports that will be available from the Faculty of Science.** Departmental plans that are shaped in alignment with Faculty-level and University-level strategic priorities will have the highest likelihood of success. It is our perception that BISC does not currently have the information needed to ensure the alignment of internal aspirations with higher-level goals.

Some critical information needed to support development of a viable strategic vision includes whether retiring faculty will be replaced, whether faculty growth positions would flow from enrolment growth, what supports might be available to increase graduate student stipends, whether the MPM and MET will

be able to charge differential fees, and when BISC's physical space will be ameliorated such that crisis management and hazard mitigation is not a constant companion to the pursuit of departmental aspirations. **Supporting this foundational department's goals and aspirations can, in turn, contribute to SFU's ongoing achievements as a top-ranked Canadian comprehensive University.**

Recommendations

1. Build on the focus identified in the self study to develop a vision and strategic plan.

2. Faculty of Science and SFU Administration should support BISC development of a vision in alignment with campus priorities by transparently communicating the timeline, pathways, and prioritisation of resources available to BISC, including:

- Support for the renewal of the MPM.
- Feasibility of revenue generation from the MPM and MET
- Faculty renewal plans (retirement replacements and growth)
- Support for increasing graduate student stipends
- Plans to address BISC's dilapidated infrastructure

Appendix 1.

Cross-reference between the Terms of Reference (TOR) and relevant sections of the review document.

TOR item and number	Review section(s)	Recommendations
1. Program Quality: Undergraduate	1.0 Undergraduate Programs 1.1 Quality 1.2 Curriculum/Goals/Assessment 1.3 Enrolment management 1.4 Student experience 1.5 Co-op	R1.1 R1.2 R1.3 R1.4 R1.5
1. Program Quality: Graduate 6.3 MPM program 6.4 Attracting Graduate Students	2.0 Graduate Programs 2.1 Grad Student Research 2.2 Program requirements 2.3 Funding & Benefits 2.4 Professional Programs 2.4.1 MET 2.4.2 MPM	R2.2.1 , R2.2.2 , R2.2.3 R2.3 R2.4.1 R2.4.2.2 , R2.4.2.3
2. Faculty Research	3.0 Research 3.1 Profile & reputation 3.2 Research faculty 3.3 Funding & Partnerships 3.5 Post-doctoral fellows 3.6 Complement Planning & Retirement replacements	R3.0
3. Administration	4.0 Departmental Administration 4.1 Academic administration 4.2 Office staff	R4.0
4. Workplace Environment	5.0 Working relationships 5.1 Within the Unit 5.2 With the University 5.3 With Communities	R5.1
6.2 Physical space	6.0 Infrastructure & facilities 6.1 Workplace Health & Safety 6.2 Research space 6.3 Teaching space	R6.1 R6.2 R6.3
5. Future Plans 6.1 BISC plans & identity	8.0 Future Plans	R8.0
<i>Other opportunities for improvement</i>	7.0 Equity, Diversity, Inclusion & Indigenization*	R7.0

EXTERNAL REVIEW – ACTION PLAN

Section 1 – To be completed by the Responsible Unit Person e.g. Chair or Director			
Unit under review	Date of Review Site visit	Responsible Unit person	Faculty Dean
Biological Sciences	30 March-1 April 2022	Tony D Williams	Michael Silverman (pro tem)
Notes 1. It is <i>not</i> expected that every recommendation made by the External Review Committee be covered by this Action Plan. The major thrusts of the Report should be identified and some consolidation of the recommendations may be possible while other recommendations of lesser importance may be excluded. 2. Attach the required plan to assess the success of the Educational Goals as a separate document (Senate 2013). 3. Should any additional response be warranted, it should be attached as a separate document.			
1. PROGRAMMING			
1.1 Action/s (description what is going to be done):			
1.1.1 Undergraduate program: • Reassess the core curriculum. We agree with the Review Committee that “the current science curriculum reflect[s] historical practices rather than conscious attention to current utility” and “reconsidering this [will] prove a differentiator for BISC programs”. BISC will therefore make changes to our core curriculum to, a) make our Biology program more attractive to potential Biology majors, improving student satisfaction, b) improve retention of BISC majors, c) ensure our curriculum prepares students for modern careers in biology, and d) increase flexibility and student’s choice of courses in lower division including more choice of <i>Biology</i> courses and the option of increased <i>Biology</i> content in 1st and 2nd year. a) We support reducing the number of required non-BISC courses, and the Chair will recommend that, in future, BISC majors will require only ONE MATH course and ONE PHYS course + 1 STATS course (with no other changes to current required courses, e.g., CHEM, MBB). b) The Chair will recommend the development of new lower-division <i>Biology</i> courses for BISC Majors, e.g. ‘Big Ideas in Biology’ (highlighting discovery, reasoning, and how the scientific process advances biological knowledge), ‘Biology by Numbers’ (data science and quantitative approaches to Biology) or a core skills-based course (perhaps based on BISC 212).			

c) Initially these courses will not be required for BISC majors; this will increase flexibility of lower division (e.g., if BISC students want to take more stats, math, or computer programming courses they can, but they should have the option of taking more *Biology* courses).

- **Update the department's curriculum map and develop a plan to implement standardized methods of assessing student proficiency.** The undergraduate curriculum committee will work on this process and has identified a willing faculty member who has expertise in curriculum mapping.
- **Convert BISC 'streams' into programs and rebrand the 'open' stream.** The External Review proposes that these recommendations would help us better market our programs. We agree in part – better promotion of our programs is a priority. However, we propose that the most urgent issue is to articulate the unique strengths of Biological Sciences at SFU relative to other programs and institutions (e.g., our focus on organismal function and diversity, our diverse lab courses, etc.). Secondly, we need to better communicate and promote our program strengths. This will include an update of the curriculum section of our website, with the aim of better attracting new students and serving existing students. We plan to consult with Faculty of Science recruitment staff to ensure that our efforts are strategic, and that recruiters have the information they need to promote our strengths. Once we have more clearly articulated the vision for our programs, we will revisit the question of whether students and the Department would be better served by converting concentrations to full programs.
- **Audit course information available to potential students and ongoing students.** Since the Biological Sciences Self-Study document was written, we have already deleted and temporarily withdrawn several inactive courses from the calendar. We are committed to revisiting courses that are rarely offered, to determine whether they can be offered more regularly and/or whether rare courses can be subsumed under "Special Topics" courses.
- **Consider ways to expand summer course offerings.** We are currently exploring options for increasing summer offerings, including using a Blended Learning format and/or scheduling condensed courses. This would allow students to take summer courses while providing some scheduling flexibility (e.g. to accommodate part-time jobs). This increased flexibility would also benefit faculty members, especially our teaching faculty. As the External Review notes (Section 1.7) "late announcements of examination schedules for undergraduate exams make it difficult for teaching faculty to plan for leaves or vacations".

1.1.2 Graduate program:

- **Increase graduate student income from \$24,000 to at least \$30,000/year, the equivalent of waiving tuition fees. Develop mechanisms for providing reasonable, structured increases in stipends:** We are proposing to use our BASS

allocation to offer small-value graduate fellowships approximately equal to the cost of tuition to all eligible graduate students in the MSc, MPM, and PhD programs each semester. These awards will not count toward the minimum stipend of \$24,000/year (from research assistantships, teaching assistantships, scholarships, or a small number of regular graduate fellowships). We will use any remaining BASS funding for regular graduate fellowships (\$7000), TARAs, and entrance scholarships using the usual competitive process via the department scholarships committee. The Dean of Graduate & Postdoctoral Studies has agreed to this change as a three-year pilot project, with a start date to be determined after consultation about mechanism and eligibility. We will also increase the minimum stipend of \$24,000 each year starting in September 2022 by a proportion based on a relevant measure of the inflation rate in BC in the previous year. **Note that an important part of the solution to this problem is that the value of TAs and other scholarships (e.g., GFs) are also index-linked so that these also increase annually, that SFU contributes to tuition (as at UBC) or tuition is decreased; in other words, departments need broader help from SFU, centrally, to tackle this problem.**

- **Evaluate BISC graduate program course requirements and consider options for reducing the course load ... Review MSc and PhD thesis requirements to improve completions times:** The Chair, with the Chair DGSC, will initiate a comprehensive review of the BISC graduate program in fall 2022 with the goal of substantially reducing degree completion times (currently too long at 10 semesters for MSc and 20 semesters, nearly 7 years, for PhD). **Note**, this is more complex than simply reducing the number of required MSc courses, as suggested by the Committee, as these are not set by Departments but are prescribed by General Graduate Regulations and the Dean's Office.
- **Restructure the MET program into a 16 to 20-month professional program; Investigate the potential for a differential fee structure as is appropriate for professional programs; Work with advancement and industry partners to support scholarships for needs-independent admission of diverse students into this program:** DGSC will work with the Director and Faculty associated with MET to consider these ideas. However, we are currently not convinced that a premium-fee Professional program model would be viable.
- **Restructure the MPM to become a 20 month, largely coursework-based professional degree with substantive field-based training and practicums emphasizing external opportunities for networking and learning; Investigate the potential for a differential fee structure as is appropriate for professional programs; Work with advancement and industry partners to support scholarships for needs-independent admission of diverse students into this program:** DGSC will work with the Director and Faculty associated with MPM to consider these ideas. A thorough assessment of the financial viability and potential outreach and impact of such a program would need to be conducted by the Faculty of Science prior to changing the current structure of the MPM program. Such a restructuring would be contingent upon the university administration allocating the new faculty positions to the Department, as recommended by the External Review Committee below. Without it, a restructuring exercise is unlikely to be worthwhile.

- **Retain at least three research faculty positions within the MPM; hire two teaching faculty to contribute to some classroom courses, but lead a sustained, skills-focused cornerstone field experience; and hire a program coordinator:** The Faculty Renewal plan that we recently submitted to the Dean of Science listed our second priority hire as a ‘plant physiologist/invasion biology’ a position that would contribute to maintaining the Department’s research strength in pest management and to the MPM program. However, in view of the impending retirements of four current faculty members and senior lecturer who are affiliated with the MPM program, within the next 2-5 years, additional faculty hiring to serve the ongoing needs of the MPM program would need to be made, with additional support from outside of the Departmental Hiring Plan (perhaps associated with a Faculty of Science “AgSci” initiative). Failing this, the university administration would need to accept the eventuality that the current MPM program could not be sustained as it would fail to meet the curriculum needs and research demands of its students without revitalized faculty support.

1.1.3. Course offerings, teaching loads, and teaching ‘compensation’

- The External Review identified “*gaps in teaching capacity leading to unpredictable course availability for both graduate and undergraduate students*” which they attributed largely to the operational cost of ‘uncompensated reduced teaching’ for research faculty taking on administrative or leadership roles. While this certainly is an important factor, our own analysis suggests this is a somewhat more complex problem.
- **Teaching loads:** The External Review statement that BISC research faculty teaching loads are the same as other similar departments in Biology namely two *undergraduate* courses/year + equivalents is not entirely correct. Current BISC teaching assignments are two *courses*/year (including graduate courses) + equivalents. The Chair will recommend that BISC change its teaching assignment policy to state, “BISC research faculty will normally be assigned two undergraduate courses per year, in addition to teaching one graduate course on average every 2-3 years”.
- **Compensation for teaching relief:** The External Review correctly identified that “nearly 50% of faculty are on reduced teaching to provide time for leadership or other distinctions (a very high percentage in their experience)”. Between 2019-2022 we ‘lost’ teaching capacity for ~20 courses associated with CRCs and other endowed Chairs and **36 courses** due to Admin secondments/roles. Over the same period BISC had **45 courses** taught by sessional/LTLs. Around 50% of this sessional need (~20 courses) was for 100/101/102 laboratory courses associated with teaching faculty Pro-D/study leaves and the new 1/16 course reduction for senior lecturers. **Thus, there was a net loss of teaching capacity associated with administrative workloads.**

1.2 Resource implications (if any):

- **Undergraduate program communication and marketing.** The undergraduate portion of our website needs updating with an aim to better market our programs to prospective students, and better serve our existing students. This will require (1) support and expertise from the Dean of Science office on student recruitment and retention, and (2) expertise on web design (from the Faculty of Science, or external).
- **Graduate stipend support:** As Departments attempt to maintain a decent level of Graduate student support (above minimum wage, let alone a living wage) the cost is increasingly falling to research faculty, whose grants are not increasing. It is essential that SFU recognise this and take either, or both, of the following actions:
 - a) Increase the value of TAs and scholarships that contribute to overall graduate student stipends annually to match increases in Departmental support (and inflation).
 - b) Provide central tuition support to graduate students (as occurs at UBC) or decrease graduate tuition.
- **Teaching capacity**
 - a. Letters of appointment for Administrative secondments should explicitly address the amount of teaching compensation for Departments (ideally on a 1:1 course basis).
 - b. In course planning BISC should assume 1:1 sessional teaching replacement for Faculty who get teaching relief associated with administrative positions – to avoid reducing course offerings.
 - c. For long-term, full-time secondments (>3 years) limited-term lecturer positions should be considered, to allow for continuity and broader contributions to Department (e.g. committee work).
 - d. As long as approval of sessional (and TA) support is maintained by the Dean of Science, sufficient to allow departments to deliver their programs without interruptions that negatively impact students, no additional compensation is currently needed. However, this support should recognise the impact of teaching relief associated with leadership positions, as well as that of negotiated teaching faculty workloads.
 - e. BISC requires one or more additional teaching faculty positions to maintain our excellent, experiential course offerings.

1.3 Expected completion date/s:

1-5 years

2. RESEARCH

2.1 Action/s (what is going to be done):

- **Establish a mechanism to better support research leaders in applying for, and administering, large scale national or international leadership grants and develop mechanisms to incentivise application to Non-DG funding sources, e.g. direct industrial partnerships, MITACS awards, NSERC Partnership grants.** We are already working closely with the Research Grants Facilitator in the Faculty of Science who have prepared a detailed BISC Research Funding Report. We will continue to work with them to identify funding opportunities for specific faculty or research groups. Additional support is available from ISA but as a “cost-for-service model” so not all can afford this. Additional operational support *at the level of the Department* would be useful.
- **Review the new faculty mentorship program and onboarding resources.** Current onboarding includes being paired with a mentor. When new faculty start, they also meet individually with the Chair, MLO and MAS. We will review the effectiveness of these programs and expand our Faculty Resources Page (<https://www.sfu.ca/biology/internal-resources/faculty-staff.html>) to include additional information. We will also pursue discussions with the Dean of Science to explore creation of an FoS web page that could include common resources/information.
- **Hold a retreat to identify and further delineate the long-term research foci of the department and develop a cohesive strategic hiring plan that focuses on a vision for BISC over the next 10-20 years (such as the organismal biology focus outlined in the self-study document).** We will hold a retreat in fall 2022 to “*build on the focus identified in the self study*” to develop a strategic plan for the Department. However, as the External Review highlighted, meaningful planning will require the Faculty of Science and SFU Administration support “*by transparently communicating the timeline, pathways, and prioritisation of resources available to BISC*”, including a) support for the renewal of the MPM, b) viable Faculty renewal plans (retirement replacements and growth), c) support for increasing graduate student stipends, and [most importantly] d) plans to address BISC’s dilapidated infrastructure.
- **Ensure faculty renewal plans are driven by research priorities** (with the exception of professional programs). This issue always represents a fine balance in any Department. Through the Retreat (above) we will ensure we have a cohesive research vision for BISC while also supporting our teaching mandate. This, however, will only be possible with clear information on faculty renewal.

2.2 Resource implications (if any):

- On-going approval of faculty positions (research, as well as teaching) to allow for faculty renewal (and hopefully even growth), including realistic financial support for renovation costs and start-up as well as appropriate laboratory space.

2.3 Expected completion date/s:

On-going, but Faculty renewal is a long-term (10-year) process.

3. ADMINISTRATION

3.1 Action/s (what is going to be done):

- **Complete a needs assessment and prioritize hiring to support the MLO and technical staff.** We feel this is a priority, mainly due to the increase in MLO workload associated with BISC's "dilapidated infrastructure" (Shrum). We have initiated discussions with the Dean's office (and other Science Departments) to discuss the possibility of an APSA role that can provide additional support to the MLO role across the three life-science Departments.
- **Complete a needs assessment and prioritize hiring a new position to support the MAS; to address workload from downloading of duties from central University offices to departmental staff (e.g. imminent changes to financial grant management, such that compliance, funding availability, and managing award terms will now be the responsibility of department staff).** We have already initiated discussions with the Dean's office (and other Science Departments) to discuss the possibility of an APSA role that can provide additional administrative support to faculty members and relieve some of the workload of the MAS across Departments.
- **Hire an additional technician or technician assistant who is broadly trained and can provide operational support across undergraduate labs.** We would welcome additional technician support, but we would prefer to hire a broadly-trained operational support (e.g. a 'lab coordinator') to ensure adequate operational support across our many undergraduate labs.

- **Review the course scheduling process to ensure practical challenges of space and workload are part of the decisions.** The MLO is already involved directly in our course scheduling process so that any space and workload issues are identified (though, again, with workload implications for the MLO).
- **Ensure teaching lab safety is regularly assessed and managed by the department.** BISC does follow the established FoS safety inspection processes and has a very good record of compliance for laboratory safety (confirmed by the Science Safety committee). Despite limited staff resources (see above) the Department has managed to provide regular safety inspections for all teaching and research space. Additional operational support from FoS would be welcome and BISC will liaise regularly with the newly established Assistant Director Safety role in the Dean's office to provide an additional layer of safety compliance and ensure that lab safety (teaching and research) is regularly assessed. It is noteworthy, however, that these assessments are not designed to identify potential systemic and structural safety issues due to the decaying building.
- **Request earlier announcements of examination schedules for undergraduate exams to allow teaching faculty to plan for leaves or vacations.** Students and Faculty are equally frustrated by the late announcement of examination schedules, sometimes only a few weeks before the exam period starts. Exam schedules should be available early in the semester.
- **Develop an EDI action plan that reaches across department functions, and does not depend solely on the EDI committee.** Our newly-formed Department EDI committee will consider this. The Chair has already met with the Associate Dean EDI to discuss how the Department can most effectively develop EDI initiatives while taking advantage of, and not simply duplicating, the many other EDI initiatives and resources from other SFU units (e.g. the Office for Aboriginal People, the Indigenous Curriculum Resource Centre, ISTLD, CEE, and the BC campus Indigenization Professional Learning Series).

3.2 Resource implications (if any):

- Approval of funding and positions to increase operational support at the level of the Department for administrative and laboratory operations workload

3.3 Expected completion date/s:

1-5 years

4. WORKING ENVIRONMENT

4.1 Action/s (what is going to be done):

- **“It is important that the Faculty and upper administration re-establish consistent open, consultative, and respectful two-way communication with BISC”.** As the Review highlights, “The lack of clear commitments, or even some framing of future possibilities from higher levels of leadership makes it virtually impossible for BISC to plan effectively to strengthen or grow its programs”. The Chair is certainly of the opinion that Departments are currently undervalued as a key part of a good, collegial governance model for the University (compared to 10-15 years ago), and that clear pathways for communication between Chairs and Senior Administration, even via Dean’s, are woefully inadequate. Chairs do not feel that their voices are very often heard or that the university administration has a full understanding of the challenges at the Department level.
- **We strongly recommend that the Dean and Associate Deans establish mechanisms for periodic meetings with the BISC department administration to discuss departmental challenges and opportunities and how these relate to the yearly budget request.** I think all Chairs in Science would appreciate more dedicated time with just the Dean and Associate Deans in the Dean’s Advisory Committee (DAC) with a focus on ‘strategic’ issues. Most of the time in these meetings is currently taken up by verbal report on (sometimes important) administrative issues from FoS staff that perhaps could be relayed to Chairs in other ways.
- **Establish regular, open (virtual) Q and A sessions with the Chair as an adjunct to formal faculty meetings.** The Chair is happy to consider this if BISC faculty think this is a good idea (though hopefully this can be in person).

4.2 Resource implications (if any):

- Department's need better *operational* support from central units, including Human Resources, SRS, Facilities Services, and EHS.

4.3 Expected completion date/s:

- Hopefully as soon as possible

5. PHYSICAL SPACE (SHRUM BUILDING)

5.1 Action/s:

- **“As with previous reviews, we highlight the urgent importance of creating and sharing a concrete plan for providing suitable research and teaching space for BISC in the near future”.** The External Review makes clear that “the infrastructure problems facing BISC have been well-documented” and that addressing “these poor facilities [were] identified as a key priority in the last external review (2013), *yet SFU has done nothing about it*”. BISC is certainly very concerned about this issue, and fully endorses this recommendation from the External Review Committee.
- **With regard to omission of BISC from the proposed new Life Sciences’ building, whether intentional or not,** “the idea that BISC, which has been in substandard space for more than a decade (while other departments have moved into new space), is worthy only of leftovers from units that move to a new building at some undefined point in the future sends a strong message that this department is not valued by SFU”. BISC appreciates these comments and is grateful that the external reviewers highlight the impact these (non)actions have on the morale in our Department.
- **Clearly acknowledge that the poor state of the Shrum Building does not mean that BISC itself, or the discipline of Biology, is in decline.** BISC fully endorses this recommendation from the External Review.
- **In the interim, there needs to be better recognition of, and support for, the fact that BISC is constantly dealing with crisis management, and is being penalized in myriad ways, by the poor state of the Shrum building, with numerous associated ‘costs, e.g.**
 - a) An unsustainably high workload for the BISC Manager Lab Operations

- b) Department-prioritized hiring positions not being approved due to high, but realistic, renovation costs of Shrum research space
- c) Disruption of teaching and research activities while 'remediation' proceeds from regular flooding events.
- d) Significant health and safety risks (e.g., increased exposure to asbestos, lead-based paint, and mold due to flooding) and insurance costs (e.g., the Department is required to pay \$1000 deductible for any equipment damaged or lost due to flooding).
- e) Recently-renovated, and well-designed, teaching laboratories in Shrum under constant risk of floods and other damage from the crumbling infrastructure.

We feel that it is important that the University immediately initiates a planning process *together with the Department* to address both short-term remedies and longer-term prospects for the continued, safe operation of our research and teaching activities.

5.2 Resource implications (if any):

- There needs to be a comprehensive plan to deal with the serious problems associated with the Shrum building, especially to address the needs of Biology. It is obvious that this will involve significant resources both short-term and long-term. The Department is not in a position to make recommendations on where these resources come from, but strongly feels that its needs must take precedence over other less urgent projects. The University, in the past, managed to house the entire Chemistry department for more than a year in other places during the renewal of their building, and we feel that similar efforts are necessary now.

5.3 Expected completion date/s:

- Completion of the process will take years, but discussion and development of short-term and long-term plans need to be started immediately, with the goal of a comprehensive plan being in place in 2023.

The above action plan has been considered by the Unit under review and has been discussed and agreed to by the Dean.

Unit Leader (signed)  Name _____ Title...Professor, Chair .. _____	Date 27 July 2022
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Section 2 - Dean's comments and endorsement of the Action Plan:

Broadly speaking, I strongly support the initiatives outlined in the BISC Action Plan. In particular, I would like the department to focus on assessment of the core curriculum and better define (and market) the academic streams (Programming - 1.1.1). In doing so, the department is likely to increase its undergraduate enrolments along with emphasizing its unique research strengths. These two elements are essential for departmental viability and growth.

Programming continued: Regarding graduate training (1.2), I applaud the department for increasing the graduate student stipend and potentially coming up with creative ways to utilize their BASS funding rather than expecting faculty members to make up the entire difference on their operating grants. I agree that the University should also increase graduation funding appropriately, e.g., inflation-linked TA-ships, and other forms of support.

Although an important historical field of study in BISC and potentially important for the nascent Agri-Tech initiative, I am concerned about the long-term viability of the Masters in Pest Management program (MPM). The current faculty have not been apparent champions of this program, and considering the general slow-down in hiring, it will be challenging for BISC and the Faculty of Science alone to build in this area. A broader discussion may be required, e.g., including the VP-A, Dean, and Chair, to request specific support from the University, such as new hires targeted to the MPM program.

The Dean of Science office (DoS) will provide support where capable, for example, employing the DoS' Marketing and Communications team to improve the BISC website and support recruitment and retention. I also acknowledge the concern about the compensation for teaching relief for research leadership/administration roles and will work with the department to try and direct more resources towards the BISC teaching complement.

Research: The research plan is well-considered and should be pursued as described. The DoS grant facilitators have been spending more time assessing all departments across the Faculty with regard to grant opportunities beyond NSERC Discovery Grants (DG), and BISC has already been benefitting from these efforts, for example, the submission of more industry partnership and NSERC Alliance grants.

It is well-known to Administration that the BISC facilities are dilapidated, and how this negatively affects research, faculty recruitment, and high-quality personnel (HQP) training – It is imperative the university address these issues with major funds to support modernizing BISC research (and teaching) labs.

Administration: I appreciate the already demanding workload placed on the administrative side of the department, and this burden will only increase over time, e.g., oversight of grant management, deteriorating infrastructure. To this end, the DoS has agreed to a temporary, one-year Manager of Laboratory Operations (MLO) to support the three life sciences departments (BISC, MBB, BPK), and this role may be extended or made permanent by the incoming Dean (A. Brooks-Wilson). Additionally, discussions are underway as to how best to support the Manager Administrative Services, either through centralized staff or ones embedded in the department(s). The DoS expects a path forward by the end of the summer.

Regarding safety, as noted, the DoS has a new Associate Director, Safety & Projects, which will work with all departments to manage safety inspections, hazardous chemical disposal, and safety training.

I laud BISC for the formation of an EDI committee and look forward to its efforts on incorporating EDI principles into all aspects of the department. Further support will be available when the incoming Dean reappoints a new Associate Dean of EDI.

Working environment: I am improving communication with the Chairs, for example, the format of the Dean's Advisory Council meeting has recently changed to include an hour of open conversation with me and the Associate Deans. I have also brought up the concerns of Dr. Williams (and other Chairs) regarding the desire for better communication from the Vice Presidents; however, with the departure of Dr. Dauvergne, I will revisit communication strategies with Dr. Parkhouse. I am also happy to consider meeting with the BISC department administration to better understand their challenges.

Physical space: As stated in previous external reviews and in the present one: the condition of Shrum Biology is deplorable. The situation is beyond a departmental issue and assistance from the University is required. Recently, Dr. Williams and I have been involved in discussions with the VPA, VPF, and Facilities to address these issues with the possibility of spending a portion of the deferred maintenance budget on Shrum, but any changes "on the ground" are still in the distant future. I cannot overstate the detriment to BISC due to their space issues – They are at a competitive disadvantage for recruiting faculty and HQPs, along with using resources that should be spent on direct research costs going to exorbitant renovations.

In closing, there are a few points I would like to raise that are relevant to this Action Plan, but germane to all of Science. One is the need for University assistance in raising graduate student stipends and/or funding opportunities. I will not belabor the point as everyone is aware of the financial challenges of living in the Lower Mainland. The result of this low-level support is a large cadre of unhappy, stressed graduate students that are sometimes working second jobs to make ends meet. Another issue is recruiting quality students and competing with other programs near and far. Research faculty and departments are limited in the amount of extra income they can provide.

I have had numerous complaints, and see section 1.1.1, regarding final exam scheduling. The Faculty of Science would like to see a reversion to the previous system when exam times were announced at the beginning of the semester.

Finally, there is mention of professional programs in BISC, however, there are bigger challenges beyond programming. Science does not have "premium" space and staffing to mount and justify premium fee programs. Without some investment from the University, it is unlikely Science will develop any such programs in the foreseeable future.

Faculty Dean (pro tem) – Michael Silverman

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Date 7.15.2022

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Education Goals Assessment Plan

Unit/Program: Department of Biological Sciences

Contact name: Erin Barley (Chair, Departmental Undergraduate Curriculum Committee)

Date: July 24, 2022

Educational Goals Assessment Team

EGs will be assessed by our Departmental Undergraduate Curriculum Committee (DUCC), led by Erin Barley (DUCC Chair) and Miranda Meents (DUCC member with expertise in curriculum mapping). This plan was developed following consultation with several members of CEE (Zoe Morris - Associate Director of Educational Development; Fiona Shaw - Director Curriculum & Instruction; Alice Campbell - Learning Experience Assessment & Planning). As our plan unfolds, we may seek support from CEE staff (e.g., with Step 3).

Planned steps	Details & timeline
Step 1. Update Educational Goals We plan to seek faculty input on our current list of Educational Goals (i.e., are there EGs we should remove or add), and whether there are specific EGs that would benefit from more attention in our curriculum.	We plan to address steps 1 & 2 by administering a faculty survey (Timeline: Fall 2022), and reporting out the results to the Department at a Departmental meeting (Timeline: Spring 2023).
Step 1. Update our curriculum map Our curriculum map identifies which core courses 'Introduce' and 'Re-enforce' each of our EGs. We recognize that courses change over time, and that our EGs are likely addressed in non-core courses as well. We plan to update and expand our curriculum map by surveying faculty about EGs covered in all of our courses.	
Step 3. Targeted skill mapping The results of our survey will help us identify EGs and/or areas that we'd like to work on (i.e., gaps and/or opportunities). This will be followed up with targeted curriculum mapping that will help us to better understand these issues (e.g., do we need to introduce these skills earlier, or re-enforce them further?).	This may include some combination of meetings with course instructors, and/or student focus groups. Timeline: Begin planning Spring 2023, 4-6 months to complete.
Step 4. Update our curriculum Depending on our findings, we may wish to target skills by developing additional courses (e.g., new core or optional courses), and/or further developing skills within existing courses, and/or modifying our program requirements to ensure that the combination of courses that students take covers the EGs.	Details depend on the scope of our project, and will include reporting out to the Department. Timeline: multi-year process, details TBD.