McMaster University

FINAL ASSESSMENT REPORT

Institutional Quality Assurance Program (IQAP) Review

Life Sciences

(Undergraduate Programs)

Date of Review: April 2 and 3, 2024

In accordance with the University Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response and assessments of the Life Sciences undergraduate programs. This report identifies the significant strengths of the programs, together with opportunities for program improvement and enhancement, and it sets out and prioritizes the recommendations that have been selected for implementation.

The report includes an Implementation Plan that identifies who will be responsible for approving the recommendations set out in the Final Assessment Report; who will be responsible for providing any resources entailed by those recommendations; any changes in organization, policy or governance that will be necessary to meet the recommendations and who will be responsible for acting on those recommendations; and timelines for acting on and monitoring the implementation of those recommendations.

Executive Summary of the Review

In accordance with the Institutional Quality Assurance Process (IQAP), the Life Sciences program submitted a self-study in December 2023 to the Vice-Provost Teaching and Learning to initiate the cyclical program review of its program. The approved self-study presented program descriptions, learning outcomes, and analyses of data provided by the Office of Institutional Research and Analysis. Appendices to the self-study contained the CVs for each full-time member in the department.

Two arm's length external reviewers and one internal reviewer were endorsed by the Dean, Faculty of Science, and selected by the Vice-Provost Teaching and Learning. The review team reviewed the self-study documentation and then conducted a virtual site visit on April 2 and 3, 2024. The review included interviews with the Deputy Provost, Vice-Provost Teaching and Learning, Dean of Faculty of Science, Associate Dean of Undergraduate Studies, Director, School of Interdisciplinary Science, and meetings with groups of current students, full-time faculty and support staff.

The Director, School of Interdisciplinary Science and the Dean of the Faculty of Science submitted responses to the Reviewers' Report (August 2024). Specific recommendations were discussed, and clarifications and corrections were presented. Follow-up actions and timelines were included.

Strengths

The Life Sciences Program serves many undergraduate students and provides a broad science education that prepares them for post-graduate educational opportunities. The program strengths include:

- The flexibility of the Program: students have the freedom to select courses that are of the most interest and will help them reach their educational goals.
- Highly dedicated Faculty and Staff: despite increasing enrollment and budget pressures, faculty and staff members show dedication, innovation, compassion, and commitment to the success of students in the program.
- Leadership: The leadership team show a strong commitment to improving the program. Recent and extensive revisions of program learning outcomes and the by-laws of governance show a desire to keep the program up to date. Additionally, the program leadership has advanced the program with access to new lab and office spaces (see below). Finally, there have been many dedicated and accomplished academic faculty and staff recently hired. These new additions will help the program progress and remain relevant.
- Facilities: The program is supported by an outstanding collection of facilities. The new faculty and staff office space shows commitment to the program and those delivering the courses. Additionally, the new laboratories in the Arthur N Bourns Building (ABB) are functional and modular and serve the program well.

Opportunities for Improvement and Enhancement, including appropriateness of resources:

The reviewers highlighted the following themes as opportunities for improvement and enhancement:

- Curriculum and program development
- Resource management
- Communication strategies
- Student support and engagement
- Research opportunities and support
- Faculty and teaching staff concerns

Below, we summarize the reviewer recommendations within each theme along with our response and planned course of action.

Summary of the Reviewers' Recommendations with the Department's and Dean's Responses

Theme A: Curriculum and Program Development

Recommendation A1: Be overt about Equity, Diversity, Inclusion, and Indigeneity (EDII) in your Program Learning Outcomes (PLOs).
Department's Response and Actions to be Taken:

Equity, diversity, inclusion, and Indigeneity are priorities in SIS. In 2022, we were awarded a Garden Grant from the MacPherson Institute of $24,130 to review our curricula, embed meaningful opportunities for students to engage in activities relating to EDII in science, and understand student experiences of engaging with this content. This work revealed that Life Sciences students (n=1,206) feel learning around EDII is important (96% agreement) and science courses should include content related to EDII (92% agreement). However, a smaller proportion of students feel they've had sufficient opportunities to engage in this learning so far (76% agreement). When we piloted learning activities related to EDII in different Life Sciences courses (SCICOMM 2A03, LIFESCI 2G03, LIFESCI/SCICOMM 3P03, LIFESCI 3Q03 and LIFESCI 4DD3), students shared that they appreciated these learning opportunities and felt they were valuable to their personal and professional development.

Although learning related to EDII was previously implicit in *PLO 2: Critically evaluate the ways in which social, political, and environmental influences impact human health outcomes*, these findings and the reviewers' recommendations validate our desire to make EDII a more explicit thread through our program. We are thus considering a new PLO:

- *PLO3: Analyze the process and outcomes of science in the context of ethical behaviour, equity, and inclusion.*

This addition also speaks to our desire to thread conversations about ethical behaviour in science through our program (see recommendation A2). We are currently working to map our curriculum onto this new PLO, with Drs. Tomljenovic-Berube and Robinson surveying Life Sciences instructors about specific learning activities in their courses. Once we gather this information, we will bring the new PLO3 to the Life Sciences Curriculum Committee in Fall 2024 for discussion and voting.

Dean's Response:

The Faculty applauds the work currently underway to bring EDII into the program learning outcomes as an explicit goal. Survey results compiled from Life Sciences students provide insight on how these are values that are important to our students. The addition of the new PLO3 is appropriate, and aligns with both the School and student reported interest in seeing growth in this area. It will be interesting to see the outcomes of more intentional mapping of this PLO throughout the Life Sciences curriculum. The Office of the Dean encourages the School to connect with the Office of the Associate Dean EDII as there may be a pathway in the Life Sciences curriculum for students in Life Sciences to also complete the new Concurrent Certificate in Anti-Racism, Inclusion and Equity (ARIE) in Science (anticipated to be first offered Fall 2025).

Recommendation A2: Make ethical behaviour in the context of science overt in the PLOs.

Department's Response and Actions to be Taken:

Ethical behaviour is a core tenet of science, thus students learning about the importance and process of research ethics in two core Life Sciences courses: LIFESCI 2A03 – Research Methods in Life Sciences, and SCICOMM 2A03 – Foundations in Science Communication. Students further explore the causes and consequences of unethical research and health research design in upper-year courses, such as LIFESCI 3E03 – Reproductive Endocrinology, LIFESCI 3G03 – Introduction to Epidemiology, LIFESCI 3PP3 – Communicating Science to Professional Audiences, LIFESCI 3P03 – Communicating Science to Public Audiences and LIFESCI 4DD3 – Racism & Health Inequities in Science & Health Care.

In LIFESCI 3P03, students engage in research that involves human participants and therefore requires ethics. Although the application is done when students start the course, students go through the

different components and discuss the importance of informed consent, review examples of ethical lapses, and explore how they continue to affect how people feel about science.

We agree with the reviewers, however, that ethical behaviour should be explicit in our PLOs. We are therefore considering a new PLO: Analyze the process and outcomes of science in the context of ethical behaviour, equity, and inclusion. Drs. Tomljenovic-Berube and Robinson are surveying Life Sciences instructors about relevant learning activities in their courses. Once we gather this information, we will bring the new PLO to the Life Sciences Curriculum Committee this fall for discussion and voting.

Dean's Response:
As noted above, the incorporation of this PLO3 is appropriate and in alignment with this recommendation. The School has integrated research ethics in various core Life Sciences courses. The Office of the Dean suggests perhaps incorporating facets of ethical behaviour in science within the Life Sciences lab curriculum as well. Since LIFESCI2L03 is a required course for students in the Life Sciences, this may be a good place to position this more overt exposure to ethical research in practice as well.

Recommendation A3: Align with the Digital Learning Strategy: Strategic Priorities.

Department's Response and Actions to be Taken:
One of the digital learning strategic priorities is to **create effective learning opportunities**. Life Sciences instructors are known for their creativity, particularly in the areas of accessible and technology-enhanced teaching.

Here we note specific commitments in the digital learning strategic priority to create effective learning opportunities within McMaster's Digital Learning Strategy Framework and explain how we are realizing them in the Life Sciences programs:

1) **Commitment to implementing teaching approaches that create the best possible conditions for learning to flourish:** We have shown this through our innovation in the classroom and in wet and dry lab settings. Many of our courses are hybrid or HyFlex, providing students with the flexibility they want and, in many cases, need while also acknowledging the value of hands-on learning. Most of our instructors record their lectures and make these recordings available or have made evidence-based decisions to avoid sharing those recordings widely. Importantly, we make these decisions with student learning and satisfaction at the forefront. In some cases, students tell us recordings make it possible for them to take a course that they otherwise wouldn't be able to access. In other cases, students tell us that an instructor's decision to withhold lecture recordings (unless required due to disability or illness, for example), has deepened their learning and enhanced their university experience. These decisions by instructors, based on their students, their courses, and feedback each term, create the best possible conditions for learning to flourish.

   We will continue to engage in reflexive teaching practices. By trying things and creating meaningful ways for students to share their experiences, beyond the student experience surveys, we will keep tailoring our teaching approaches to our diverse students, our diverse course contexts, and our diverse learning outcomes.

2) **Commitment to creating new tech-enabled learning spaces on campus to enhance teaching and learning activities:** Life Sciences instructors have experimented with a variety of tech-

enabled spaces on campus, including active learning classrooms and, new this fall, HyFlex classrooms. We have shared our experiences and insights with colleagues across campus, thus advocating for more and better access to these spaces.

We will continue to test tech-enabled learning spaces, ask students for their feedback, share our experiences with peers and tech-support staff, and advocate for more access to tech-enabled spaces and tech features across campus. Indeed, it has been challenging to secure such spaces and features in some cases, so we will continue to provide evidence for demand to inform resource allocation.

3) **Commitment to providing students with opportunities to choose digital learning experiences (e.g. hybrid, online, virtual, HyFlex) where possible and appropriate to the program and learning outcomes:** In addition to offering many of our courses in hybrid and HyFlex formats, we have initiated plans to convert certain courses into virtual and online offerings, or to offer both in-person and online options to students. For example, Dr. Campos has requested to convert her in-person lectures to virtual ones in LIFESCI 3L03 next academic year in response to student feedback. Similarly, Dr. Moisse is creating online offerings of SCICOMM 2A03 and LIFESCI/SCICOMM 3P03 in response to evidence that many students treat her HyFlex offerings as online courses. We seek to improve the student experience in our courses by making them more accessible (complete with captions instead of the transcript that comes with live streams) and more flexible.

   We will continue to make evidence-based decisions about technology in our courses, including live streams, online modules, and virtual tutorials, with student success at the front of mind. We will work together as a teaching team to consider where online and hybrid offerings make the most sense in terms of course content and learning outcomes, of course, but also in terms of providing students with flexibility. We will also support efforts to better understand what students need and want in terms of online offerings and ensure we proceed cautiously, balancing their preferences with our commitment to providing a rich and rigorous experience.

4) **Commitment to supporting and resourcing initiatives to encourage discoverability, use and creation of open, affordable, and inclusive digital learning materials:** LIFESCI 2L03 and LIFESCI 3L03 both use open-source laboratory guides through the Pressbooks publishing platform that incorporate H5P interactive elements (e.g. dropdowns, hot spot images, videos), providing students with engaging and interactive resources. LIFESCI 2A03 makes use of H5P (free open access interactive tool) to expose students to experimental design via an experimental design simulation. For LIFESCI 3P03 and LIFESCI 3Q03, we use news articles for current events, media clips. primary literature, and government websites and books that are open access. We will continue to look for opportunities to share bespoke learning materials with students in ways that are accessible from both a learning and financial standpoint.

Another of the digital learning strategic priorities is to **develop digital literacy and proficiency**. Here we note specific commitments relating to the priority and explain how we are realizing them in the Life Sciences programs:

1) **Commitment to offering academic skills development for learners on how to best learn in digital environments:** Some Life Sciences instructors offer their courses in blended and HyFlex formats and offer students guidance and resources for optimizing their learning. For

instance, in SCICOMM 2A03, LIFESCI 3P03 and LIFESCI 3Q03, students have the option to participate virtually but are encouraged through small grade incentives to engage in synchronous polling questions, online discussions and other active learning activities to deepen their learning and link it to lived experiences.

We will continue to ensure our students are prepared to get the most out of their courses, including those with digital learning environments. Because we have required level 2 courses with digital learning elements (online modules, HyFlex lectures, etc.), we will spend time in these courses advising students on best practices in online course components and the benefits of required in-person activities such as labs and tutorials.

2) **Commitment to engaging educators and learners in informing the development of resources and workshops to support digital literacy:** Over the past three years we have introduced two dry-lab/data science courses, both of which aim to enhance students' digital literacy and expand their data science toolkits. LIFESCI 3LA3 is currently being redeveloped to engage students with open-source coding platforms (Python, R) and data visualization platforms (Tableau, PowerBI). Students will interpret and design code for programming tasks relevant to data collection, import, manipulation, and management, and develop a data toolkit of software language and packages to solve interdisciplinary life science problems. They will also discuss ethical considerations and professional opportunities related to data science and AI. In LIFESCI 3LX3, students use open data to answer a unique research question using statistical tests in SPSS taught in the course. In this hands-on course, students develop skills that are essential for future research positions, such as thesis and graduate student positions. After completing this course, many students have progressed to other research opportunities, where they use their license of SPSS and the lab manual created for the course to analyze data. As a part of the MacPherson Institute Leadership in Teaching and Learning (LTL) Fellowship, Dr. Janet Pritchard is exploring the impact of this course on statistics anxiety and is using qualitative data from focus groups with students to improve the course to increase students' self-efficacy around statistics.

   In 2015, Risdale et al., produced a Knowledge Synthesis Report: Strategies and Best Practices for Data Literacy Education. Within this report, they present a data literacy competencies matrix, organized by the five core aspects of our data literacy definition (data, collection, management, evaluation, application). 3LA3 has course learning objectives that map over to data collection, management, and application, which overlay with the focus of data evaluation and analysis in 3LX3. These two lab courses complement one another in their delivery methods to engage and motivate students, as well as encourage task commitment.

We will continue to identify and develop opportunities for students to grow and apply their digital literacy skills, rooting our decisions in evidence and pedagogical best practices.

Dean's Response:

We applaud the work the School has done towards increasing the number of HyFlex and virtual learning options that are provided to students. We encourage the School to continue to engage with the Office of the Associate Dean, Undergraduate Studies through the Science Online Learning Project. Through this project, the Faculty has launched the goal to have up to 20% of Science courses offered in alternate online modalities over the next 5 years. In the interim, we encourage the School to continue to provide students with lecture recordings (where possible) in the spirit of universal design for learning (UDL) and to support students as they study throughout the duration of any given course.

The School has adopted various approaches to enhance digital literacy in the Life Sciences program. This includes the innovative use of open, affordable and digital learning materials (open-source lab guides) in the LIFESCI 2L03 and LIFESCI 3L03 lab courses. We encourage the School to consider the McMaster University AI Guidelines as they continue to enhance data literacy opportunities for their students. This should be accompanied with continued pedagogical research led by faculty members in the School, as a means of evaluation ongoing student learning outcomes.

Recommendation A4: Expand the focus of the Origins of Disease (OOD) specialization to include more societal aspects.

Department's Response and Actions to be Taken:

Revisions to the Origins of Disease specialization to expand course offerings are already underway, with proposed changes to be voted on in Faculty Council and presented in the 2024/25 Faculty of Science Undergraduate Academic Planning and Policy Committee (AP&PC) cycle. These potential changes would expand the Level III course list to include: LIFESCI 3BB3 – Neurobiology of Disease, LIFESCI 3G03 – Introduction to Epidemiology, LIFESCI 3N03 – Human Nutritional Toxicology, LIFESCI 3W03 – Genetic and Epigenetic Determinants of Health: Role in Health Disparity, and LIFESCI 3Q03 – Global Human Health and Disease which would give OOD students more exposure to societal origins of and contributors to disease.

In addition, we are proposing to include LIFESCI 4U03 (Mechanisms of Disease) as a 4th year seminar option to their capstone inquiry course LIFESCI 4CM3 (Foundations of Disease States Inquiry Lab). LIFESCI 4U03 will be modified to focus on critically evaluating disease in humans from multiple perspectives. There is also discussion of adding LIFESCI 4DD3 (Racism & Health Inequities in Science & Health Care) as a capstone option, though we must consider whether this course will be on the capstone list for our in-development specialization (Evidence and Engagement), and balance reserve caps in these courses for specialization students with our desire to give choice to Honours Life Sciences students for their capstone experience.

We are committed to ensuring our programs align with our students' goals, honour their desire for flexibility, and meet the rigorous academic standards we wish to uphold. We will continue to critically review our curricula with input from our students.

Dean's Response:

The expansion of the OOD specialization Level III course list to include additional courses that showcase the intersects of disease on society as a whole, will add valuable programming options for students within this specialization. The Office of the Associate Dean, Undergraduate Studies has worked with the School to facilitate the approval of these changes through our 2025-2026 calendar approval process. This includes adding a program note highlighting to students that the completion of the OOD specialization with the capstone inquiry lab course (LIFESCI 4CM3) would be most appropriate for students who are interested in pursuing postgraduate research opportunities. We encourage the School to consult with both the Assistant and Associate Dean, Undergraduate Studies as they work to create their new specialization. This consultation should commence as soon as possible.

Recommendation A5: Establish pathways in specializations and use them as a recruiting tool.

Department's Response and Actions to be Taken:

We currently have two specializations: Sensory Motor Systems, and Origins of Disease. The Sensory Motor Systems specialization will no longer enrol students beyond Fall 2024. Our remaining specialization is Origins of Disease, which was initially designed to have a strong molecular and cell

biology focus and be research-intensive. Based on feedback from students and a desire to expand this specialization to reflect their interests and our commitment to offer interdisciplinary curriculum that includes a consideration of the societal impact of science, we are proposing a series of curriculum updates this fall. Specifically, we are making optional some courses that students viewed as barriers that weren't essential for achieving the PLOs, and we are adding more course options that address "origins of disease" aspects not previously acknowledged in the curriculum, such as social determinants of health. As mentioned in A4 above, we are also providing flexibility in the specialization's capstone experience by offering students a choice between the hands-on, research-intensive lab course LIFESCI 4CM3 and the seminar course LIFESCI 4U03. We made this change so we could also increase enrolment in the specialization, as the program was capped at 25 because of the senior lab course but could now go up to 50-60 students.

When we made the decision to close our Sensory Motor Systems specialization, we began discussing a potential new specialization built on expertise and offerings that are now stable in SIS. The working title for this specialization is **Evidence and Engagement**. It would package existing Life Sciences offerings in the areas of research methods, data science, social determinants of health, and science communication to provide an undergraduate science degree that equips students for graduate programs and careers in global and public health, knowledge translation, and health promotion -- fields that many of our students currently identify as strong interests in upper levels. We aim to propose this new specialization after consultation with colleagues in Science, Social Science, Humanities and Health Sciences. We hope that its introduction into calendar in the next two years will assist in recruiting students with an interest in "science and society" and provide a structured learning experience for science students whose career aspirations lay outside the lab.

Dean's Response:
The Office of the Associate Dean, Undergraduate Studies has worked with the School to facilitate the approval of curriculum changes through our 2025-2026 calendar approval process. Going forward, we encourage the School to monitor and evaluate student learning outcomes and experiences following completion of the OOD with either the research-intensive lab course (LIFESCI 4CM3) or the seminar course (LIFESCI 4U03). It will be important to ensure that students are still attaining all program level learning outcomes with the same proficiency, especially if they are completing different capstone experiences. It will also be important to ensure that students are appropriately advised on which of these capstone experiences would be most appropriate for students with different postgraduate career ambitions (e.g. research inclined vs not).

The working concept for the new specialization is appropriately tied to the expertise of the current faculty complement within the School. We ask that the School consult with both the Assistant and the Associate Dean, Undergraduate Studies on how best to proceed. This consultation should be started first within the Faculty of Science (including fiscal modeling), before broader consultation is done with other Faculties.

Theme B: Resource Management

Recommendation B1: Consider an admission cap.
Department's Response and Actions to be Taken: Each academic unit in the Faculty of Science (FOS) is expected to have one open program. Honours Life Sciences is the open program in SIS. It is the largest open program in the FOS and represents an

important revenue stream in our Faculty. Therefore, it is not possible to consider establishing a cap for this program.

Although we have both a mandate and a desire to maintain our open program, we are keeping a close eye on enrolment numbers in both the level 1 Life Sciences Gateway and in level 2 Life Sciences Programs over time. This will ensure we have offerings and course caps that honour our commitment to fulfilling student program requirements while providing students' flexibility and prioritizing their experience in our programs.

Dean's Response:

Since the last Life Sciences IQAP, several programs across the Faculty have also created new level 2 core programs. With that, we have seen an increase in the number of seats and programs that are made available to Level 1 Science students. This has led to a rough stabilization in Life Sciences program numbers over the last few years. The Faculty will continue to monitor Level 2 program numbers, in alignment with the Learning Pillar of our Faculty of Science Strategic Plan towards better enabling the "matching of current and future students to programs"

Recommendation B2: Review the curriculum with a resource planning eye to increase efficiency.

Department's Response and Actions to be Taken:

Over the past three years, we have made critical changes in entry and program requirements aimed at both expanding possibilities for students (ensuring they have many options for satisfying their degree requirements), reducing redundancies and relieving pressure points. For instance, we now require BIOLOGY 1M03 – Biodiversity, Evolution and Humanity, thus ensuring access for our students into upper-level Biology courses. We also now require BIOLOGY 2C03 – Genetics, and eliminated our version of the course, LIFESCI 2G03 – Genes, Genomes and Society. This change also expands access for our students into upper-level Biology courses and eliminates a Life Sciences course that was not equivalent to BIOLOGY 2C03 and did not lead into any upper-level Life Sciences courses. We also eliminated LIFESCI 2AA3 – Introduction to Topics in the Life Sciences, as many students were not taking this course in level 2 as intended and, those who were, were taking it in Winter term when its intention as an introduction fell flat.

We codified our commitment to science communication by requiring that students take SCICOMM 2A03 – Foundations in Science Communication, and one of either LIFESCI 3P03 – Communicating Science for Public Audiences, or LIFESCI 3PP3 – Communication Science for Professional Audiences. This change allowed us to rename Course List A from "Communication Skills" to "Advanced Topics in Life Sciences," increasing depth of knowledge and eliminating the need for resource-intensive communication assessments in discipline-focused Life Sciences level III courses.

We also renamed our Course List E from "Research Seminar" to "Capstone Experience" and gave students the option to satisfy this program requirement with a thesis project or independent study. This has relieved pressure on our seminar courses, which had been capped at 25 and were often staffed by sessional instructors. Finally, we increased the cap on our seminars to 50 in Fall 2023. We did this to further reduce our reliance on sessional instructors, provide better access to popular seminar courses, and enhance the student experience by ensuring they have a SIS instructor in their capstone course. All these changes have streamlined our programs, enhanced options for students and allow us to attend to the Faculty of Science budgetary constraints.

We will continue to scrutinize our curriculum and ensure students meet all PLOs despite the flexibility of our programs. We will also look for opportunities to streamline offerings and create clear pathways

for students to achieve their program requirements with a transcript that speaks to their interests, skills, and values. We are currently engaged in discussions about instructional support, with Dr. Janet Pritchard leading an effort to rethink how we staff our courses with skilled graduate TAs to best serve our students. Efforts such as this will ensure we maintain a strong student experience across our courses, given the diversity of content and learning activities, within the constraints of a budget deficit.

Dean's Response:
The School has done a very good job over the last few years to both expand curricular options for Life Sciences students, while eliminating redundancies in programming. While it is important to work with students and ensure that their programing is aligned with their interests' skills and values, we encourage the School to maintain consultations with external partners and employers to ensure that the evolving Life Sciences curriculum continues to prepare students for labour market demands in alignment with career-reading skill development.

The Faculty currently employs undergraduate and graduate student teaching assistants. With the limited availability of graduate teachings assistants, like with other units, we encourage the School to utilize more senior undergraduate teaching assistants for first- and second-year courses, reserving graduate student teaching assistants for higher level lab, data science, science communication and seminar instruction.

Recommendation B3: Examine class sizes to consider resources vs. student experience.

Department's Response and Actions to be Taken:
Enrolment in the Honours Life Sciences Program has fluctuated over the past four years, with enrolment increasing to over 200 more students than expected during the Covid-19 pandemic. To accommodate this increase in enrolment and to ensure curriculum delivery with restrictions during the pandemic, some courses had to increase capacity. For example, for the Winter 2021 offering of LIFESCI 3LL3: Living Systems Laboratory (now LIFESCI 3LX3: Biostatistics and Scientific Writing), 96 students were enrolled in the course to provide a virtual laboratory experience and allow students to fulfil Course List B: Laboratory Skills requirements. The enrolment capacity for this course was decreased to 50 students in 2023 and 2024 with enrolment of 39 and 43 respectively, given the return to pre-pandemic levels of intake into the program. This is a more appropriate number for students in a hands-on lab course with one section and one graduate TA.

In other courses however, enrolment capacities have not decreased back to levels that instructors feel are optimal for students. For example, LIFESCI 3LA3: Data Science, was a course that was also created during the pandemic to give students the opportunity to fulfil Course List B: Laboratory Skills requirements, and the increasing interest among students in data science. This course had an enrolment capacity of 100 during the pandemic and has not been adjusted to align with the active teaching approach taken by the past and current instructor (Dr. Heather O'Reilly) given that there continues to be a robust interest from students as seen by enrolment always filling the available capacity. Another example is LIFESCI 3G03: Introduction to Epidemiology. The interest in this course has increased since its development in 2017 (perhaps due to the pandemic and our students' interest in public/global health), consequently enrolment capacity increased from 40 students in 2017 to 150 students in 2023. Currently (2024 academic year) while capacity is still set at 150, enrolment has decreased to 59 students. The capacity of the experiential course, LIFESCI 3XX3: Peer Mentoring in the Life Sciences, increased from 36 students 2021 in each of its deliveries (term I and II) to 79 enrolment capacity in 2023 and 2024 with enrolments of 65-66 students in these years in both

deliveries (term I and II). In contrast to previous offerings with lower enrolment caps, students have indicated that the mentoring experience (which is a key outcome in this course) has been significantly and negatively impacted.

Whether increasing enrolment capacity directly impacts student learning is challenging to know given the many factors that can impact the student learning experience. However, with more predictable, stable enrolment in the Honours Life Sciences Program, we are starting to discuss enrolment capacities for our courses, particularly for Level 3 and 4 courses in which students are seeking more experiential learning and more connection with their peers and Instructor. As a School, we value protecting these experiences for students and we want to use progressive, active learning strategies in our classes, which is challenging and sometimes counter-productive in large classes.

We are mindful of the need to maintain access for students in our courses, and the budget constraints of creating multiple capped sections. Our course caps must honour students' interest and their need to fulfill program requirements. That said, we also want to optimize the student experience in our courses. We review course caps every year taking into consideration curriculum requirements for graduation as set in calendar and historical enrolment (student demand and interest), as required in an open program. This coming year we will review course caps particularly for our level 3 courses. Many of these courses were once capped at 100 because they had written assessments (a requirement for our "Communication Skills" course list A). Now that we have made our science communication courses required and renamed Course List A "Advanced Topics in the Life Sciences," we must revisit our level 3 course caps to balance student demand and instructional approaches. We also hope to revisit the prospect of course waitlists to better understand demand for our courses and plan accordingly.

Dean's Response:

One of the challenges for many Departments/Schools with larger enrolment programs is the balance between course enrolment and student experience. While we recognize the goal of incorporating active learning strategies in the classroom, this can still be facilitated in large enrolment courses, as is done in other large enrolment courses across the various Departments/Schools within the Faculty. This is often accomplished through small-group classroom activities that are built into course lectures and can be further enhanced in smaller tutorial and lab environments. With that, we encourage the School to ensure that pedagogical aspirations do not compromise student access to course enrolment and overall experience. Especially if smaller class sizes result in lower chances of students enrolling in a popular course in any given year. This would be ultimately detrimental to the Life Sciences student experience, and counter to how the program is advertised as providing students with flexibility and choice in programming. At the same time, we encourage the School to maintain sightlines on course enrolment numbers in courses at comparable levels across the Faculty. Especially as it relates to fiscal sustainability practices, and workload equities for faculty members within the School relative to other Departments/Schools (e.g. teaching 2 sections of 200 students each across two terms = 6 units, vs. those faculty members in other Departments/Schools that teach 1 section of 400 students in one term for 3 units teaching credit). These benchmarks will continue to be monitored by the Office of the Dean from a budget-specific perspective.

Recommendation B4: Monitor the impact of CORE programs in other majors on the enrolment in the Life Sciences Program (LSP).

Department's Response and Actions to be Taken:

We have been closely monitoring the impact of core programs, particularly the Biology core, on our own enrolment. We are pleased that our enrolment in Honours Life Sciences program has returned to

pre-pandemic levels of approximately 400-450 per level, though we do expect fluctuation in the coming years based on level 1 Life Sciences Gateway numbers. The Biology Core experienced the same increase in enrolment during the pandemic years but has seen the same decrease in enrolment in the same timeline we have.

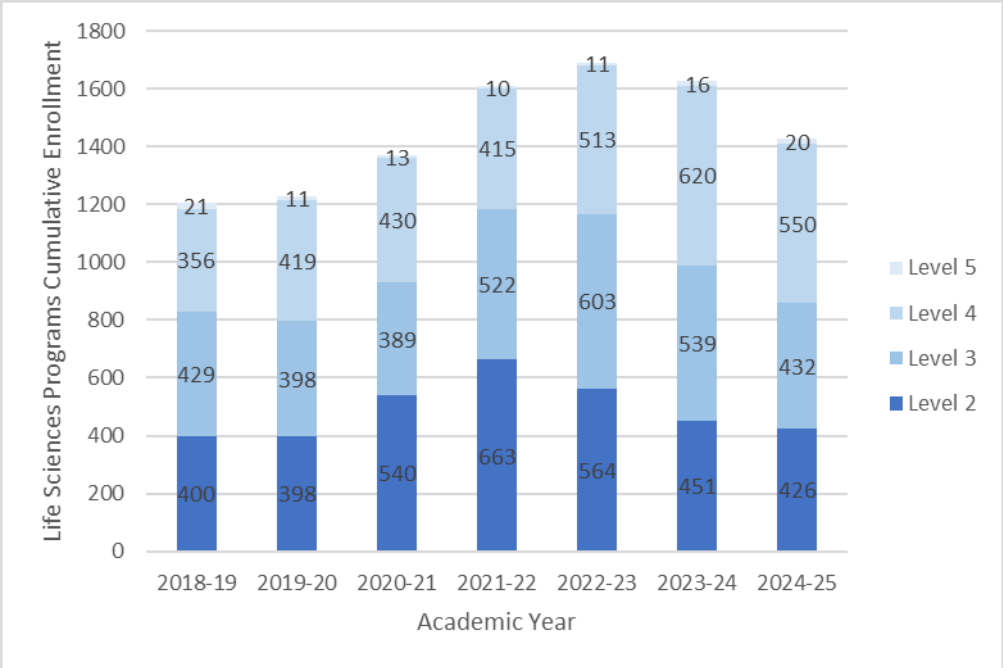

Figure 1: Fluctuations in Life Sciences Program enrollment throughout the past seven academic years. Large increases in level 2 student intake seen during pandemic years (2020-21, 2021-22, 2022-23 each show much higher than expected program intake). Two of these three large cohorts of students graduated in 2023 and 2024. Pre-pandemic intake levels of students have been seen in 2023-24 and 2024-25. This figure includes enrollment for each of the five Life Sciences programs (LSP, HLSP, OOD, SMS, CO-OP).

Although we are comfortable with our current enrolment numbers, which have returned to pre-pandemic levels, we are eager to recruit and retain curious, compassionate, and engaged students in our programs. We are especially eager to recruit students into specializations that prepare students for careers in research, science policy and allied health. We see the refinement of our Origins of Disease specialization and the development of our Evidence and Equity specialization as opportunities to tailor our programming for the unique interests of our students, many of whom pursue graduate programs in biomedical research as well as public and global health. We strive to help them build transcripts that reflect their knowledge, skills, and values.

We will continue to monitor the impact of other open programs on our enrolment. We will use our monthly Life Sciences program meetings and our annual curriculum review process to ensure our programs meet the unique needs of our students and their desire to choose courses that speak to their interests and goals.

Dean's Response:

Since the last Life Sciences IQAP, several programs across the Faculty have also created new level 2 programs. With that, we have seen an increase in the number of seats and programs that are made available to Level 1 Science students. This has led to a rough stabilization in Life Sciences program numbers over the last few years. The Faculty will continue to monitor Level 2 program numbers, in alignment with the Learning Pillar of our Faculty of Science Strategic Plan towards better enabling the "matching of current and future students to programs"

Our Level 1 program numbers will remain stable for the current 2025 recruitment cycle, unless there is additional government funding to support an expansion of Level 1 intake. At this point in time, we project that there will not be additional Level 1 growth until there is additional fiscal support so that this can be provided to our Departments and Schools to accommodate for increased learners in our Levels 2-4 programs.

We once again encourage the School to consult early on within the Faculty, especially with both the Assistant and Associate Deans, Undergraduate Studies as the design of the Evidence and Equity specialization gets underway.

Recommendation B5: Optimize physical space in labs and classrooms.

Department's Response and Actions to be Taken:

The Life Sciences program has two teaching laboratory spaces whose maximum usage can fluctuate depending on enrollment. The reviewers misunderstood that our lab spaces are completely full. This was true at peak enrollment in 2020-2021 when we only had one laboratory room, but with the opening of a second teaching lab in Winter 2022, our capacity has increased greatly. These spaces allow us to offer our two larger enrollment lab courses, LIFESCI 2L03 – Living Systems Laboratory, and LIFESCI 3L03 – Laboratory Methods in Life Sciences in both terms, which has ultimately increased our seat capacity. It has also allowed us to offer LIFESCI 4CM3 in our own teaching lab spaces; previously it was run out of the Biology teaching labs. Having each course run in two terms also allowed us to offer a smaller class size, more individualized access to laboratory equipment and improve student-to-TA contact by enrolling 24 students per lab section in LIFESCI 2L03 (effective Fall 2022) and 27 students in LIFESCI 3L03 (effective Fall 2023), however our teaching spaces can accommodate up to 30-32 students, allowing for expansion should student enrollment increase, or should we be asked to reconsider TA resources should TA allocation be impacted by funding deficits. Alternatively, we do not currently offer our laboratory courses in the spring/summer session. We have tried to offer LIFESCI 3L03 in spring before, but ultimately there was insufficient interest. Should there be demand beyond the maximum capacity indicated below, we may consider providing spring/summer offerings as needed.

Course	Current Capacity	Maximum Capacity
LIFESCI 2L03	24 students/section, 12 sections (fall) + 10 sections (winter) = 288 + 240 = 528 seats	32 students/section, 12 sections (fall) + 10 sections (winter) = 384 +320 = 704 seats total
LIFESCI 3L03	27 students/section, up to 10 sections/term = 270/term, 540 total	30 students/section, 10 sections = 300/term, 600 seats total

We will continue to carefully monitor enrollment for our two main laboratory courses and adjust lab section capacity and/or second section offering as needed to balance optimal student learning with the physical spaces we have, and the resources SIS has been provided.

Dean's Response:

The Faculty has supported the School by advocating for and supporting the creation of two undergraduate laboratory spaces with ample research grade equipment that is made available to all

Life Sciences students. While there is aspiration for smaller laboratory section sizes, we encourage the School to model lab capacities to maximize both TA resources and equipment availability.

Theme C: Communication Strategies

Recommendation C1: Develop a central communication strategy for all LSP students.
Department's Response and Actions to be Taken: We currently have Avenue shells for each level in Life Sciences Programs, which we use to communicate important opportunities and reminders. We also use in-class announcements and course Avenue shells to share important information, such as reminders about our ballot process. We could consider using MS Teams for the same purpose, though this is a cumbersome task from an administrative perspective. We do have separate MS Teams space dedicated to each of our current specializations, which are easier to manage because of its limited enrolment. We also use our SIS website to post news and opportunities, such as TA positions, however traffic to the website is typically driven by other means, such as email or Avenue posts. We are mindful that students have preferences when it comes to information-sharing, and that social media may be more impactful than Avenue or in-class announcements. That said, social media messaging takes time, effort, and expertise to do well. For this reason, we typically partner with the Faculty of Science communications team, and the Life Sciences Society, to communicate through their social media channels. Although the size of our program makes it difficult to reach everyone, we endeavor to communicate in many ways to ensure our students feel connected. Moving forward, we will work closely with the Life Sciences Society presidents, who are members of our program committee, to ensure we tailor our communications to the needs and preferences of our students. We will also explore what other departments are doing that is working well. For instance, the Department of Chemistry and Chemical Biology has a TV in their hallway to advertise important dates, upcoming events and more. We could consider putting a TV in our lab hallway in ABB, an area that is frequented by many Life Sciences students when taking our laboratory courses.
Dean's Response: One of the concerns raised through the review was specifically around students wanting greater transparency regarding why the SMS program was being discontinued. Based on this feedback, we also encourage the School to consider inviting a Life Sciences Society representative to all School Council meetings. This is a practice that has been undertaken by many other Departments/Schools and often involves representation by the respective society presidents. This has allowed for dual communication between units and the student body. Communication can also be increased via emails that can be distributed directly by the School to all Life Sciences students by level or specialization. It is a good idea to place a TV outside the ABB Life Sciences laboratories, but it will be important to ensure that announcements remain up to date. Inclusion of QR codes on displayed announcements could also increase traffic to important Life Sciences website areas (e.g. Experiential learning, news and opportunities).

Recommendation C2: Update the information and consolidate communication with students regarding program planning.
Department's Response and Actions to be Taken:

We have made several curricular changes over the past three years that will help students better plan their program paths. For instance, renaming Course List A "Advanced Topics in the Life Sciences" better signals the opportunity to build depth of knowledge, and requiring foundational courses that serve as pre-requisites for upper-level courses opens more doors for students in terms of achieving their program requirements. That said, we are mindful that the flexibility in Life Sciences Programs – in many ways a strength – also poses a challenge.

Our Academic Program Advisor, Kai Wen, does an excellent job counseling students on how to achieve their program requirements in ways that speak to their interests and goals. We are also grateful to advisors in the Office of the Associate Dean Undergraduate Studies. We rely on these advisors to address student queries and concerns promptly. That said, we are also eager to empower students to build their path independently.

Our website does provide examples of ways students can build transcripts that speak to interests in public/global health, research, healthcare, and more. But maintaining the website, which lists courses of interest in other units, is cumbersome. We have endeavored to provide opportunities for students to discuss program planning in our level 2 courses (LIFESCI 2A03, 2L03 and SCICOMM 2A03), but sometimes students take these courses after level 2.

In 2023, Dr. Tomljenovic-Berube worked with two students to map program pathways and make an interactive tool for students. They had a prototype in Pressbook and were eager to extend the project. The project was paused to consider the updated SIS website as an alternative hosting platform; the project also requires additional funding to implement. We can revisit this and collaborate with students to create a program planning tool that will work for them. We are also exploring the possibility of engaging our peer mentors from LIFESCI 3XX3 in sharing materials and guidance outside of courses.

Dean's Response:

We recognize that as a program with inherent flexibility, students in Life Sciences may find it difficult to home in on the best courses to pursue based on their own interests. We applaud the School for efforts that have been taken to support Life Sciences students in their program paths. The Office of the Associate Dean, Undergraduate Studies will also continue to support all Life Sciences students who have program-related inquiries.

It will however be important to ensure that all Life Sciences students can have this guidance made available to them early on in their program. This was the goal of the now no longer offered LIFESCI 2AA3 course. The reviewers suggest introducing a required course to help students learn more about program options. If these discussions are already happening in required courses like LIFESCI 2A03 and LIFESCI 2L03, an option may be to consider requiring that these courses be completed in Level 2 of the Life Sciences program. Efforts should also be made to enhance the visibility of programming options as posted on the SIS website. This can be made more visible if posted as an announcement with a QR Code outside the ABB Life Sciences labs.

Recommendation C3: Improve alumni communication.

Department's Response and Actions to be Taken:

Communication with McMaster alumni is managed by the Alumni Office. We have partnered with the office to get alumni contact information for certain outreach activities, such as our 25th anniversary celebration. We have also partnered with the Alumni Office to get a sense of where our students go in terms of careers.

Many Life Sciences instructors maintain strong relationships with past students. Indeed, many of us invite alumni to visit our courses to share relevant experiences in graduate school or the workforce with current students. We often use our personal LinkedIn accounts to keep in touch.

We could consider creating a Life Sciences LinkedIn account and invite students to follow when they join the program; this will keep us connected to them even when they graduate. We could also invite students to share a personal email with us, perhaps through a level 4 survey or when we ask them to participate in the ballot process for research seminars. This way we would have their email contact even after their McMaster email stops working.

We will reach out to the Alumni Office for guidance on these ideas and implement a plan by the end of the 2024/25 academic year.

Dean's Response:
We applaud the School for the continued efforts related to improving communications with Life Sciences alumni. It is a good idea to create a LinkedIn account that is directly tied to SIS. Continued engagement with the Alumni Office will further support these efforts. We encourage the School to also consider featuring alumni testimonials on the SIS website, as a reflection of their experience in the Life Sciences program, while also highlighting how the program helped them attain their post-graduate career paths.

Theme D: Student Support and Engagement

Recommendation D1: Launch successful Spring/Summer offerings.

Department's Response and Actions to be Taken:
We have successfully offered spring courses in the past. For instance, a spring offering of LIFESCI 3P03 in 2020 was well-subscribed, with 100 students. That said, it was a virtual offering during the pandemic. When we tried to launch an in-person offering of LIFESCI 3L03 in spring 2022, there was insufficient enrolment, and the course was ultimately cancelled.

We are mindful that spring/summer offering have a cost in terms of teaching units, and we are at capacity in SIS. Any additional courses would need to be taught by sessional instructors. An important exception to this is our experiential courses: LIFESCI 3EP3, LIFESCI 3RP3 and LIFESCI 4EP6. These courses require students to find an academic and/or community supervisor and are managed by an Instructional Assistant rather than a faculty member. We have been offerings these courses in the spring/summer since before the formation of the School of Interdisciplinary Science, providing students with flexibility in meeting their Course List C program requirement.

We recognize the university's desire to offer spring/summer courses to increase flexibility for students. This is an important initiative that will lead to better retention and student satisfaction. Considering this, we are beginning to design online versions of select courses, such as SCICOMM 2A03 (required) and LIFESCI/SCICOMM 3P03 (one of two required level 3 science communication courses). We plan to introduce an online section of SCICOMM 2A03 to the undergraduate calendar in Fall 2024, followed by LIFESCI/SCICOMM 3P03 in Fall 2025. We will scrutinize the student experience in these online courses as we begin to imagine other spring/summer offerings.

Dean's Response:

As previously mentioned, we encourage the School to evaluate teaching unit allocation relative to the practices that are deployed in other large enrolment programs across the Faculty (e.g. teaching 2 sections of 200 students each across two terms = 6 units, vs. those faculty members in other Departments/Schools that teach 1 section of 400 students in one term for 3 units teaching credit). While there are fiscal and workload equity considerations, it will also be important to ensure that there is consistency in Life Sciences program instruction, mainly provided by full-time SIS faculty members. The Office of the Dean will continue to evaluate these Department/School specific benchmarks as part of the budget allocation process.

It is good to see that the School continues to provide students with the option to complete experiential courses during the Spring/Summer terms as this maximizes flexibility for Life Sciences students. The Office of the Associate Dean, Undergraduate Studies is currently supporting the creation of online versions of various Life Sciences courses and will continue to do so through the Science Online Learning Project. The Office of the Dean is committed to supporting this project by providing participating faculty members with appropriate relief to develop these courses, in addition to ongoing remuneration for online courses once deployed.

Recommendation D2: Develop common spaces for LSP students to interact.

Department's Response and Actions to be Taken:

We have greatly enjoyed welcoming students to our new office space. There are often groups of students coming through to meet with instructors, chat with an advisor, or gather in the conference room. That said, our space is small relative to the size of our program. Over the years we have worked with the Life Sciences Society to create opportunities for students to gather, mingle and meet with Life Sciences instructors us in a more social setting. For instance, each fall we have a "meet the profs" night open to students in any level of our programs. Each spring, we have the Interdisciplinary Research Symposium, where students share their thesis projects with peers and instructors. We also have mini symposia each semester for placement and practicum students and their supervisors.

We are eager to create more opportunities for interaction. Drs. Hall and Moisse are developing a science art contest, in which students will be invited to submit work to hang on display in our office space. We would love to have a "gallery opening" of sorts to welcome students to the space. We will also consider SIS seminar programming that is of interest to students and work to advertise such opportunities widely. Importantly, we look forward to our continued collaboration with the Life Sciences Society and imagining more opportunities to bring together students, staff, and faculty.

Dean's Response:

Together with creating two new undergraduate laboratory spaces, the Faculty has also supported the creation of a new SIS wing. We encourage the School to continue to invite students to visit these spaces. The idea of a science art contest may be a good starting point. Collaboration with the Life Sciences Society will also likely inspire additional opportunities for Life Sciences students to interact with each other and their instructional teams. The Office of the Associate Dean, Undergraduate Studies will continue to support approval of these events. A regular seminar series hosted by the School could provide Life Sciences students with the opportunity to not only interact, but also to share their program and experiential learning specific experiences. For any specializations, it may also be important to work to cohort students from these programs within the smaller lab/tutorial sections so that they can meet peers within their program more easily.

Recommendation D3: Develop waitlists for Life Sciences courses.
Department's Response and Actions to be Taken: We have, after much effort and research, proposed to implement waitlists for selected Life Sciences courses, in particular our level 3 courses that consistently fill. Understanding the appetite for these courses beyond the enrolment cap would help us better accommodate student interest. We proposed to begin by prototyping a small number of waitlists to determine whether it is worthwhile investing more resources in this approach. However, since waitlists are managed manually and given the current capacity constraints in the Office of the Associate Dean Undergraduate Studies, waitlists remain a future aspiration. We hope to revisit the possibility of waitlists again ahead of Fall 2025 enrolment.
Dean's Response: Forecasting seat availability to student interest remains a challenge to all programs across the Faculty of Science. While many Universities have overcome these challenges through the implementation of waitlist functionality during enrolment periods, McMaster has yet to do so. As a large enrolment program, the Office of the Associate Dean, Undergraduate Studies appreciated the SIS proposal to pilot a small number of waitlists, but asked for this pilot to be halted as there was concern that with only a small pilot, there would be tremendous protest that waitlists were not implemented across all Science courses simultaneously. With that, the Office of the Associate Dean, Undergraduate studies will be working in the upcoming year with the Office of the Registrar to identify a strategy by which we can implement waitlists across all Science courses, and perhaps inspire the same practice across the University as a whole. We believe that this functionality will better allow us to forecast course enrolments and resource allocations.

Theme E: Research Opportunities and Support

Recommendation E1: Enhance research opportunities for students.
Department's Response and Actions to be Taken: The Dean of Science has established a new Office of Undergraduate Research (OUR) to enhance research opportunities for undergraduate students. Many new initiatives have been implemented to create opportunities for students to carry out research. For instance, Drs. O'Reilly and Moisse have hired students from levels 1-3 for summer research projects through the OUR. We have also counselled students to explore opportunities for paid research and research placements through the Office. In September 2023, Dr. Alexander Hall established the Science in Society Lab. During the academic year 23-24 in addition to supporting 6 LSP students on for credit research projects (LIFESCI 4A12C/15C and 3RP3), the Lab also took on another 8 LSP students as research volunteers and employed 2 LSP students as paid RAs working on ongoing SIS pedagogy projects. In 24-25 these opportunities are due to grow further, as Dr. Hall is expecting to take on 12 LSP students in the Lab in the Fall. Dr. Hall is hoping to continue to expand the opportunities for research opportunities, both paid and volunteer for LSP students going forward. We hope that the Science in Society Lab can continue to act as a conduit for training and supporting RAs working on the many education and pedagogical focussed projects happening across SIS. We will continue working with the OUR to ensure our students feel supported in pursuing research opportunities.
Dean's Response: The Faculty of Science Strategic Plan includes within the Learning Pillar, the goal of Increasing undergraduate student participation in research. This includes not only supporting our Departments

and Schools with funding to purchase mission critical research-grade equipment within our laboratory spaces, but also supporting students by providing central services through the Office of Undergraduate Research (OUR). Piloted in 2023 through Strategic Alignment Funding (SAF) from the Office of the Provost, the OUR has increased student access to skills workshops, research colloquia, graduate student shadowing, summer research experiences, and has implemented new level 2 research courses that are available to all Science students. The OUR is currently seeking to also implement level 1, 1-unit courses that will allow students to gain credit for short-term research opportunities (e.g. 12 hours in duration). We encourage SIS faculty to continue to engage with the OUR as a number of students who partner with this office are from the Life Sciences Program. We believe that there will be continued opportunity to collaboratively increase the number of research opportunities made available to Life Sciences students. This can include research under the supervision of both teaching and research stream SIS faculty members.

Recommendation D2: Implement a research application process for students.

Department's Response and Actions to be Taken: The OUR (see E1 above) has implemented application processes for several different research activities.

Creating a standardized research application process like the one suggested would be challenging to integrate into the Life Sciences research-based courses because many students in LSP are overseen by faculty outside of SIS. Many departments and even individual faculty members have their own process in place for recruiting undergraduate research students. To develop a process that works for the research-based courses in the LSP, it would need to seamlessly integrate with the existing process in other departments. Otherwise, it could potentially add more confusion. Additionally, instituting a standard research application process might not solve the bottleneck which is that there are more research-seeking students than there are positions available.

That said, we could consider having a deadline for applications across the School such that supervisors can consider all applicants and project ideas before offering positions. We will discuss this in our Fall 2024 Council meetings and consider implementing a spring deadline for the 2025/26 academic year.

Dean's Response:
Many Life Sciences students are already applying for research positions outside of SIS. While it may be hard to incorporate a standardized research application process for Life Sciences students, the School can consider a mechanism by which the research application processes and deadlines of other Departments and Schools across Science can be advertised to Life Sciences students. It may also be worthwhile to implement a standardized research application process for any students who are working with faculty members within SIS, as this would allow for greater transparency to all Life Sciences students, and better guidelines on how to apply for these positions with both teaching and research stream faculty within the School. We recommend that the School consult with other Departments/Schools that already have this process in place across the Faculty, should this process be under consideration within SIS.

Recommendation D3: Provide resources for teaching staff to engage in research.

Department's Response and Actions to be Taken:
While most of the faculty who teach in the Life Sciences Program are Teaching Stream faculty (contract 80% teaching, 20% service, 0% research), many faculty members actively seek internal and external funding (example: teaching and learning grants and student partner funding through the MacPherson Institute and the Office of the Vice Provost Teaching & Learning) to facilitate research

projects that we conduct with undergraduate students. Life Sciences instructors and instructional assistants have secured more than $269,199 in funding through such grants and programs.

Our faculty values providing unique, hands-on learning experiences for students, and we see that many of these research practicum and thesis opportunities lead to other research opportunities, such as graduate school. In addition, students build important independent learning, research and communication skills while working on research projects with faculty. To help facilitate some of the projects that we conduct, Teaching stream faculty in the FOS receive start-up funds, which they can use to engage in research through the hiring of student partners and research assistants. Several Life Sciences instructors have used their start-up funds for such research endeavors.

However, while we value and are encouraged to engage in research, both for the benefit of our students and for our own career progression, it is challenging to meet the demand from students for the number of positions that we can offer with the current contract of 80:20. In the recently released McMaster University Faculty Association (MUFA) report, "Recommendations on the policies and procedures for teaching stream faculty" by the Working Group on Teaching Stream Faculty, this issue was brought up. A recommendation (p16 of the report) is to consider the financial implications of a 70:10:20 contract to allow teaching stream faculty the necessary time to continue offering these valuable research opportunities to our undergraduate students. Another idea that emerged from the report was to consider research with undergraduate students as a part of service, which may be important for the annual Record of Activities review for Career Progress and Merit. Based on the report, this issue seems to be widespread across the university.

Members of the Life Sciences instructional team will continue to apply for funding to support their pedagogical research interests and innovation goals. The SIS Director and the Associate Director (Life Sciences) will amplify these efforts through letters of support and team grant submissions, such as our SIS Garden Grant. We will continue to advocate for policy changes that support pedagogical research by teaching stream faculty.

Dean's Response:
We applaud and value the work and efforts undertaken by SIS teaching faculty to secure research funding that has been utilized to support pedagogical research, programming and Life Sciences student experiences. Procedures and policies around teaching stream faculty workload and research recognition have been a topic of greater discussion over the last 10 years at McMaster. The most recently struck Teaching Stream Task Force has provided a report to Joint Committee (MUFA and the University- July 2024) that will now evaluate all recommendations to determine future possible University-wide directions in these areas.

Within the Faculty of Science, the Office of the Dean has recently launched the Ad Hoc committee on Undergraduate Supervision. One mandate for this committee is to "provide guidelines for departments/programs regarding best practices for considering undergraduate research supervision as part of the overall teaching workload." We expect a report from this committee by the end of 2024.

Theme F: Faculty and Teaching Staff Concerns

Recommendation F1: Clarify scholarship issues to recognize the time required in promotion.

Department's Response and Actions to be Taken:
The policies that govern permanence and promotion and that define the nature of and the threshold of scholarship for promotion are established centrally through the Joint Committee and are found in McMaster policy that governs appointments and career progression. A task force to review all aspects of the teaching stream position was created in 2023 and a set of recommendations issued that may include a more transparent definition of scholarship. This report was published by the McMaster University Faculty Association on July 5th, 2024. We wait to see whether there will be changes to the policies that govern career progression and teaching stream professor workload.

Dean's Response:
Procedures and policies around teaching stream faculty workload and research recognition have been a topic of greater discussion over the last 10 years at McMaster. The most recently struck Teaching Stream Task Force has provided a report to Joint Committee (MUFA and the University- July 2024) that will now evaluate all recommendations to determine future possible University-wide directions in these areas.

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While we await the outcomes of these committees, the Faculty recognizes the tremendously positive contributions of our teaching stream faculty members. As such, we have added a teaching stream faculty member representative as a consultant to our Faculty of Science Tenure, Permanence and Promotion (TPP) committee. This has been done with the goal of ensuring that our teaching stream faculty members are appropriately adjudicated during times of permanence and promotion.

Most recently, the Office of the Dean has recognized that TPP packages are not consistently compiled across the Faculty. As such, the Dean will lead a conversation around appropriate guidelines for the TPP package assembly. This will include teaching stream faculty submissions, and will better allow the TPP committee to evaluate all teaching stream faculty according to evolving University policies and practices.

Recommendation F2: Allow teaching stream faculty members on the Tenure, Promotion, and Permanence (TPP) committee.

Department's Response and Actions to be Taken:
We find this recommendation to be outside the scope of an IQAP review for an undergraduate program. Teaching stream faculty members are allowed in all academic units to belong to TPP committees upon annual request. In the case of SIS where we have a standing TPP committee which is composed of all faculty members who have obtained permanence/tenure and achieved Associate rank. According to current policy the composition of the committee must be approved annually. The issue is not that teaching stream faculty are barred from serving on the TPP committee. Rather, the issue is that we must request approval, which is always granted. We have requested multiple times that policy be changed in such a way that eliminates the step of approval request and sets up a default committee composition that always includes teaching stream members. This is again central

policy that we in SIS cannot unilaterally change. It is the case that there is a report from a task force on TS faculty position workload.

Dean's Response:
The Faculty recognizes the tremendously positive contributions of our teaching stream faculty members. As such, we have added a teaching stream faculty member representative as a consultant to our Faculty of Science Tenure, Permanence and Promotion (TPP) committee. This has been done with the goal of ensuring that our teaching stream faculty members are appropriately adjudicated during times of permanence and promotion.

Recommendation F3: Address faculty workload issues.

Department's Response and Actions to be Taken:
We recognize that everyone's workload has increased over the past several years, as detailed in a recent MUFA report. SIS has worked to manage the increased workload and address pain points, such as the increase in student requests for accommodations through Student Accessibility Services (SAS) and the McMaster Student Absence Form (MSAF), with support provided by Instructional Assistants (IAs) and Head Teaching Assistants (Head TAs, which are graduate TAs that teaching stream faculty can choose based on experience and expertise to assist with managing their courses and TA teams). We are currently well-supported in SIS, with IAs and one lab technician deployed to all three lab courses and to other courses according to enrolment. In addition, SIS provides Head TAs for teaching stream faculty who do not have IA support.

That said, we are mindful of issues relating to faculty workload and strive to create opportunities for discussion between Life Sciences instructors and between faculty members and central supports, such as SAS. For instance, we have used our departmental seminar slot to welcome colleagues from SAS, the Student Success Centre, and the Office of Undergraduate Research (the latter dedicated to supporting students in accessing research opportunities – a task that sometimes falls to faculty). Life Sciences instructors have also been active on university-wide committees aimed at understanding workload challenges and proposing solutions, such as policy updates. In the meantime, instructors are consistently encouraged to operate within their capacity, creating assessment schemes and workflows that work for them within the constraints of the course management policy.

Dean's Response:
The Faculty recognizes that as we have emerged from the pandemic, we are seeing an increase in supports that are requested from our Science students. With that, the Office of the Associate Dean, Undergraduate Studies has hired 3 additional academic advisors, and an Accessibility and Accommodations. This has led to a tremendous ability to provide increased support to our students, Departments and Schools. We encourage the School to continue to refer students to this office, especially when dealing with complex challenges. We also encourage SIS faculty members and instructional staff to contact the Office of the Associate Dean, Undergraduate Studies whenever there are additional supports that can be provided by our central team. Similarly, as a Faculty, we continue to engage with central University offices and services to ensure that our Science faculty and staff are appropriately supported by these central offices.

Recommendation F4: Enhance transparency on discussions of Student: Faculty ratios.

Department's Response and Actions to be Taken:
SIS-wide teaching allocation grids with course caps have been shared regularly with all faculty. Last year, in the file tab of the General channel of the School Council MS Teams site, a folder was created

to archive and make accessible to all relevant data reports and policy documents (SIS Data and Documents), including enrolment reports.

Regarding IQAP reviewers concerns of a higher student /faculty ratio in SIS in comparison to other units in FOS and lack of transparency in SIS regarding this issue, it is indeed the case that SIS has the highest student/faculty ratio in Science.

This is explained by the unusual faculty complement in SIS relative to that of other units. SIS faculty body is composed of mostly teaching stream (TS) faculty with a teaching load that is higher than that of tenure track (TT) faculty (TS 18 units UG, TT 6 units UG). Therefore, SIS as an academic unit delivers curriculum to a much higher number of students per faculty if one does not take into consideration that the contract of most of the SIS faculty expects a higher number of courses to be delivered.

In contrast, all other units in FOS count with a faculty body that is composed mostly of TT positions. For this reason, a simple student/faculty ratio is not an appropriate metric to evaluate SIS overall faculty teaching load in a manner that takes into consideration not only the number of courses individual faculty deliver, but also the enrolment in these courses (i.e. course caps).

The way FOS has evaluated teaching activity in different academic units has been by calculating Teaching Units (TU) / TS or TT (TU is defined as # course units X #students taught/ # TS or # TT). This data was shared with reviewers during the site visit. It has now been shared with LSP faculty to address the concern voiced by reviewers of lack of transparency and to give SIS faculty an appropriate data set.

We will continue to discuss these data and reflect on how class sizes as well as activities inside and outside of one's teaching load, such as course structure, assignments, accommodations, student supervision, mentoring, reference letter requests and more, contribute to SIS faculty overall workload. While it is true we are well-supported in terms of TAs and IAs, we will continue to advocate for the maintenance and increase of teaching and administrative support to further amplify the impact of workload associated with delivering innovative interdisciplinary curriculum to our large and diverse student body.

Dean's Response:

The review team and SIS faculty have been provided with a comparison of teaching units benchmarks by unit/department across the Faculty of Science. While the Life Sciences program has a larger student/faculty ratio by dividing the number of students by number of faculty members, the chart provided to both SIS faculty and the review team gives a more accurate account with teaching outputs across the units within the Faculty of Science. The chart depicts teaching units as an output of students that are taught, across the Faculty of Science. Taken together, the teaching unit output ratio within the School of Interdisciplinary Science is lower than the average across the Faculty of Science.

It is important for the School to take these calculations into consideration, and to also ensure that pedagogical practices to not compromise student access to courses. While the Life Sciences program is currently the largest program in the Faculty, there are instances where teaching stream faculty members are given extra workload credits that are not provided to other faculty members across the Faculty (e.g. teaching 2 sections of 200 students each across two terms = 6 units, vs. those faculty members in other Departments/Schools that teach 1 section of 400 students in one term for 3 units teaching credit). This is the likely a contributing factor to why teaching unit output ratio within SIS is lower than the average across the Faculty of Science.

McMaster University

March 7, 2025

McMaster University

Implementation Plan

In the chart below, please outline the recommendations made by reviewers, briefly outline the actions you plan to take, who will be responsible for leading the action, and a timeline for completion.

Recommendation	Action(s) to be Taken	Responsibility for Leading Action	Timeline for Completing Action
A1. Be overt about Equity, Diversity, Inclusion, and Indigeneity (EDII) in your Program Learning Outcomes (PLOs).	Map our curriculum onto the proposed PLO3, discuss and vote on the addition of PLO3.	Associate Director (Life Sciences) and Life Sciences Curriculum Committee	Fall 2024
A2. Make ethical behaviour in the context of science overt in the PLOs.	Map our curriculum onto the proposed PLO3, discuss and vote on the addition of PLO3.	Associate Director (Life Sciences) and Life Sciences Curriculum Committee	Fall 2024
A3. Align with the Digital Learning: Strategic Priorities.	Continue to engage in reflexive teaching practices and make evidence-based decisions about technology in our courses. Continue to test tech-enabled learning spaces, ask students for feedback, and advocate for access. Continue to identify and develop opportunities for students to grow and apply their digital literacy skills in our programs.	Life Sciences Curriculum Committee	Ongoing
A4. Expand the focus of the Origins of Disease (OoD) specialization to include more societal aspects.	We will update the OoD curriculum and continue to critically review our curricula with input from our students.	OoD Coordinator, Associate Director (Life Sciences) and Life Sciences Curriculum Committee, Office of the Dean (including the Assistant and Associate Deans, Undergraduate Studies)	Fall 2024

A5. Establish pathways in specializations and use them as a recruiting tool.	We will continue to develop a new specialization in Evidence and Engagement in consultation with colleagues in Science, Social Science, Humanities and Health Sciences.	Associate Director (Life Sciences) and Life Sciences Curriculum Committee, Office of the Dean (including the Assistant and Associate Deans, Undergraduate Studies)	Fall 2024
B1. Consider an admission cap.	We will continue to monitor enrolment numbers in both the level 1 Life Sciences Gateway and in level 2 Life Sciences Programs and ensure our offering meet student need.	SIS Director	Ongoing
B2. Review the curriculum with a resource planning eye to increase efficiency.	We will continue to scrutinize our curriculum and ensure students meet all PLOs. We will also look for opportunities to streamline offerings and create clear pathways for students to achieve their program requirements. We will engage in discussions about TA allocation to ensure we are optimizing the student experience within the constraints of our current process.	Associate Director (Life Sciences), Life Sciences Curriculum Committee, SIS Director, and Academic Department Manager	Ongoing
B3. Examine class sizes to consider resources vs. student experience.	We will discuss course caps in our level 3 courses and try to balance student access into our courses with our pedagogical practices and assessment approaches. We will also revisit the prospect of course waitlists.	Associate Director (Life Sciences) and Life Sciences Curriculum Committee	Fall 2024
B4. Monitor the impact of CORE programs in other majors on the enrollment in the Life Sciences Program (LSP).	We will continue to monitor the impact of other open programs on our enrolment. We will use our monthly Life Sciences program meetings and our annual curriculum review process	Associate Director (Life Sciences), Life Sciences Curriculum Committee, SIS Director, and Academic Department Manager	Ongoing

	to ensure our offerings align with students' interests and goals.		
B5. Optimize physical space in labs and classrooms.	We will continue to carefully monitor enrollment for our two main laboratory courses and adjust lab section capacity and/or second section offering as needed within our capacity.	SIS Director and Academic Department Manager	Ongoing
C1. Develop a central communication strategy for all LSP students.	We will work with the Life Sciences Society (LSS) presidents to tailor our communications to the needs and preferences of our students. We will also explore MS Teams channels and a TV by the labs.	Associate Director (Life Sciences) and Life Sciences Curriculum Committee in collaboration with LSS	Winter 2025
C2. Update the information and consolidate communication with students regarding program planning.	We will revisit our collaboration with students to create a program planning tool. We will also explore the possibility of engaging our peer mentors from LIFESCI 3XX3 in sharing materials and guidance outside of courses.	Associate Director (Life Sciences), Life Sciences Curriculum Committee	Winter 2025
C3. Improve alumni communication.	We will reach out to the Alumni Office for guidance on communicating with alumni and tracking their outcomes.	Associate Director (Life Sciences) and SIS Director	Winter 2025
D1. Launch successful Spring/Summer offerings.	We will look for opportunities to add spring/summer offerings that will be well-subscribed within the constraints of teaching unit allocation.	Associate Director (Life Sciences), Life Sciences Curriculum Committee and SIS Director, Office of the Dean (including the Assistant and Associate Deans, Undergraduate Studies)	Winter 2025
D2. Develop common spaces for LSP students to interact.	We will continue collaborating with the Life Sciences Society to bring students and instructors	Life Sciences Curriculum Committee in collaboration with LSS	Winter 2025

	together. We will also launch our art contest and expand our seminars to welcome students.		
D3. Develop waitlists for Life Sciences courses.	We will revisit the prospect of waitlists for select courses.	This will be led by the Office of the Associate Dean, Undergraduate Studies, in collaboration with all Science Departments and Schools	Winter 2025
E1. Enhance research opportunities for students.	We will continue working with the OUR to ensure our students feel supported in pursuing research opportunities.	Associate Director (Life Sciences) and SIS Director	Ongoing
E2. Implement a research application process for students.	We will discuss having a deadline for applications across the School such that supervisors can consider all applicants and project ideas before offering positions.	Associate Director (Life Sciences) and Life Sciences Curriculum Committee	Fall 2025
E3. Provide resources for teaching staff to engage in research.	We will continue to apply for research funding to support their research interests and goals. SIS Director and Associate Director (Life Sciences) will support these efforts through letters of support and team grant submissions. We will continue to advocate for policy changes that support pedagogical research by teaching stream faculty.	Associate Director (Life Sciences), Life Sciences Curriculum Committee and SIS Director	Ongoing
F1. Clarify scholarship issues to recognize the time required in promotion.	We will continue to advocate for policy changes that support the engagement of teaching stream faculty in scholarly activities.	Associate Director (Life Sciences), Life Sciences Curriculum Committee and SIS Director	Ongoing
F2. Allow teaching stream faculty members on the Tenure,	We will continue to advocate for policy changes that address the barriers in SIS.	Associate Director (Life Sciences), Life Sciences Curriculum Committee and SIS Director	Ongoing

Promotion, and Permanence (TPP) committee.			
F3. Address faculty workload issues.	We will continue to engage in discussions with central supports, such as SAS, and advocate for policy changes that address workload issues. We will continue to encourage instructors to operate creatively within their capacity and the constraints of the course management policy.	Associate Director (Life Sciences), Life Sciences Curriculum Committee and SIS Director	Ongoing
F4. Enhance transparency on discussions of Student: Faculty ratios.	We will continue to discuss and reflect on how class sizes as well as activities outside of one's teaching load contribute to perceptions of a high student-to-faculty ratio. We will also discuss ways to refine processes, such as TA allocation, to further recognize workload issues.	Associate Director (Life Sciences), Life Sciences Curriculum Committee and SIS Director	Ongoing

McMaster University

Quality Assurance Committee Recommendation

McMaster's Quality Assurance Committee (QAC) reviewed the above documentation at the January 23, 2025, meeting. The committee recommends that the **Life Science** undergraduate program should follow the regular course of action with an 18-month progress report and subsequent full external cyclical review to be conducted no later than eight years after the start of the last review.