

Final Assessment Report

General Science, Honours Science and Joint Honours Science & Arts Major (BSc)

July 2019

Summary of the Program Review:

In accordance with the University's Institutional Quality Assurance Process (IQAP), this final assessment report provides a synthesis of the external evaluation and the internal response of the Science programs (General Science BSc, Honours Science BSc¹, Joint Honours BSc) delivered by the Faculty of Science. A self-study (Volume I) was submitted to the Associate Vice-President, Academic on September 15, 2017. The self-study presented the program descriptions and learning outcomes, an analytical assessment of these programs, including the data collected from student focus groups along with the standard data package prepared by the Office of Institutional Analysis & Planning (IAP). The CVs for the four Associate Deans and resumes for full-time staff in the Science Undergraduate Office were included in Volume II of the self-study.

Two arm's-length external reviewers were selected from Volume III of the self-study. Dr. Lisa Carter, Dean (Science and Technology), Athabasca University, and Dr. Peter Hollings, Professor of Science and Environmental Studies, Lakehead University were ranked and selected by the selected by the Associate Vice-President, Academic. One internal reviewer, Dr. Lorne Dawson, Professor of Sociology and Legal Studies was selected to accompany the external reviewers.

Reviewers appraised the self-study documentation and conducted a site visit to the University on December 5-6, 2017. The visit included interviews with the Associate Vice-President, Academic; Dean of Science; Science Associate Dean, Undergraduate; Science Associate Dean Co-op and Computing; Science Associate Dean, Student Relations; Science Associate Dean, International Programs, and a number of faculty members, staff and current students. The review team also had an opportunity to visit teaching rooms, undergraduate laboratories, student study and club spaces, and meet with representatives from the library.

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

¹ The Faculty of Science offers 20 honours BSc majors; this review refers to one BSc major: Honours Science.
July 2019

Program characteristics:

These programs offer students the opportunity to tailor their studies into the subject area(s) of their choice (i.e., BIOL, CHEM, EARTH, MNS, PHYS, and/or SCI), obtain hands-on lab training, and prepare for the next step in their career path. General Science provides a viable path to complete a Science BSc degree for students who are not suited to an Honours program. The Honours Science BSc program prepares students for further training in graduate studies or professional schools, such as medicine, optometry and pharmacy.

General Science (BSc)

During the review period, there were an average of over 350 students enrolled in the three-year General Science program each Fall term, yet only an average of four students choose this program each year from the start of their university studies. Most students are enrolled in this program as a result of an academic standing that moves them involuntarily to General Science. The small number of students starting in this program aim to complete the degree online. The only requirement difference for students completing the degree online is that they do not have to complete lab courses.

Honours Science (BSc)

During the review period, there were an average of over 700 students enrolled in the four-year Honours Science program each Fall term. Honours Science students can take some online courses, but they cannot complete the degree online because of the lack of senior science courses online and the lab training requirement. Students who complete a sufficient amount of any UWaterloo honours Science BSc major before completing the UWaterloo's Doctor of Optometry or Doctor of Pharmacy programs are awarded the Honours Science BSc degree with their professional degree to recognize their pre-professional science training.

Joint Honours Science and Arts Major BSc (Joint Honours)

Features of this program include the ability to complete an Honours Science BSc program and the [departmental requirements](#) for an Arts major. These students may encounter greater unit requirements than for an honours Science BSc program. In the past seven years, only four students have completed the Joint Honours Science and Arts Major BSc degree.

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

Strengths

The General Science and Honours Science BSc programs both have several strengths. These programs:

- are purposefully designed to support student choice. This flexibility allows students to build their knowledge, skills and judgment, while meeting requirements and fulfilling interests
- allow students to readily add Science and non-Science minors through the BSc program's flexible design
- have strong support for program advising that has developed in the past year as academic advisors now 'own a program', thereby becoming a champion and advocate for the program and its students
- provide a worthwhile educational experience and overall satisfaction with choosing UWaterloo, according to student feedback data
- allow opportunities for students to develop professional skills, explore their career options, and, as of Fall 2017, market themselves to employers and school selection committees by completing the [EDGE certificate](#)
- allow students to encounter a notable female representation among instructors in life science-based courses

Strengths of the Honours Science program include:

- a strong foundation for students planning to pursue professional school or graduate school, allowing for a personalized plan of interest
- enabling students to complete a joint program in non-science subjects to personalize their training at a deeper level
- providing students enrolled in any honours Science BSc major before completing their UWaterloo's Doctor of Optometry or Doctor of Pharmacy programs, an opportunity to receive the Honours Science BSc degree with their professional degree to recognize their pre-professional Science training

Strengths of the General Science program include:

- allowing students challenged by capacity (health, intellect, time, finances) to complete a university degree in science
- affording an opportunity for students entering professional school at another university to obtain a UWaterloo degree for their pre-professional training
- providing a shorter route than a four-year degree to certain subsequent post-secondary training opportunities

Challenges

Identified challenges include:

- A proportion of students in these programs would prefer to complete a different honours Science BSc major (with higher program averages, greater unit counts and program-specific courses)
- A notable proportion of General Science students face barriers to their academic success (e.g., on-going health issues)
- There is no cohort-based student club for these students (unlike department-based programs within the Faculty of Science)
- The varied interest and reasons for entering the programs makes it more challenging to engage in community and cohort building
- A notable number of Faculty of Science departmental faculty view the General Science and Honours Science students as ‘second-class’. This view proves challenging when advocating for students accessing high-demand lectures and labs
- The Faculty of Science needs to continue focusing attention on quality faculty hires that continue to improve the representation of women on faculty in currently underrepresented departments (Chemistry, Earth and Environmental Sciences, and Physics and Astronomy)

Weaknesses of programs

Identified weaknesses include:

- Honours Science students can complete their degree without any 400-level science courses
- Some General Science students pursue this degree, disappointed that they could not meet their initial honours program requirements
- International students may view the General Science and Honours Science programs negatively if they expect a more structured curriculum that is more subject-specific. This may be particularly problematic for students who involuntarily enter these programs

Summary of key findings from the external reviewers:

The reviewers’ evaluated the three programs addressed in the self-study, with an emphasis on the General Science and Honours Science degrees. The reviewers found that the programs are largely in good standing and the top priority for improvement is related to issues around communication and awareness building, such as the need to convey more information about the opportunities that are available to students in each program.

Program response to external reviewer recommendations:

Recommendations

- 1. Need for improvement of conveying and integrating information at all levels: website, Faculty of Science, service department pages:** The reviewers suggest that improving the profile of the General Science program would have a significant impact on enrolment, while better advertising of the Honours Science program and engagement with the students will help build a sense of community.

Response

A review of all Science undergraduate webpages has begun; the anticipated outcome is a content update and reorganization to more effectively inform students about their programs, co-op, funding and awards, international exchange, student support, and student life.

A Faculty of Science webpage dedicated to General Science BSc students is being created within the Science Undergraduate Office site. It will include information such as:

- Course pre-requisite trees for science subject courses to assist General Science students with course selection
- Tips on completing minors in science and other common subjects
- Career planning and post-graduate programs as well as links to internal sites such as '[Career View Mirror, Science Edition](#)' and external sites, such as the Government of Canada's [National Occupation Classification](#) (NOC)

A similar webpage is being created for Honours Science BSc students. These webpages will have some different foci (e.g., graduate school options will appear on the Honours Science webpage). For students enrolled in these two programs, these webpages will support them with academic and post-graduate information, as well as enhance their sense of community. Consultations with the [Centre for Career Action](#) and the [Student Success Office](#) will help inform webpage development.

The vast majority of students (~97%) enter the General Science BSc program involuntarily. Realistic, positive communication about their academic and career options is important. The program-focused webpage development is not expected to impact enrolment numbers in the General Science program; however, it will impact student support. The current email communications sent to students entering either the General Science or Honours Science programs will be revised to include a link to the appropriate program webpage.

The Faculty of Science will continue to support students who enter the General Science BSc program whether voluntarily or involuntarily (the former, typically because they are completing the degree online or have received an offer from an external health professional school). A dedicated academic advisor, such as the Student Success Officer and Academic Advisor-Programs Specialist, will continue to provide support for students in each of these programs; this level of support was notably enhanced in 2016.

The Faculty of Science has no plans to make the General Science BSc program accessible to high school students through OUAC because the Faculty's marketing and recruitment priorities seek students interested in honours Science BSc study. Science recruitment resources already promote the Honours Science BSc major at the same level as its other honours Science BSc majors.

- 2. Strengthen online course delivery as integral to program offerings in The Faculty of Science:** The reviewers recommend a two-pronged approach: a) training of faculty in course delivery methodologies; b) facilitation of prompt and nimble development of courses.

Response

Bolstering the slate of online course offerings will assist all Faculty of Science students and it will be particularly beneficial to students attempting to complete the General Science BSc program online (The Faculty of Science currently offers 18 science online courses). Discussions with the Dean and the departments will occur, with the goal of incrementally increasing online course offerings, although fiscal and human resourcing will likely be the determining steps, particularly in an era where Faculties and academic support units are adjusting to the Waterloo Budget Model. Opportunities to obtain e-Campus Ontario funding will also be pursued. The [Centre for Extended Learning](#) (CEL) also offers excellent support for the development and delivery of online courses.

During the 2018/2019 academic year, one online course was added (BIOL 359). The inactivation of two online courses in 2018/2019 (BIOL 130 and BIOL 373) were not net losses because they had not been offered in several years. To date, no commitments within Science have been made to develop additional online courses.

- 3. Provide program pathways that are inclusive of all students, including access to labs, course, and 400 level courses that are distinguished from 300 level courses:** Developing pathways that can be used as examples by students to guide them in their course selection will help resolve some of the challenges posed by the flexibility of the program. Members of the advising team have already developed informal examples and it is

recommended that theses be formalized and made available through the Waterloo website.

Response

Flexibility is a key feature of the General Science and Honours Science BSc programs. This is a desirable attribute for the majority of students and a successful recruitment feature of the Honours Science program. While there is no plan to change the degree of flexibility of these programs, helping students make good decisions is a priority. These students already seek help from their program academic advisor; however, the previously mentioned new course pre-requisite trees for each subject (BIOL, CHEM, EARTH, MNS, PHYS) will help students understand the implications of whether they can or should take a course (e.g., if a course is a pre-requisite for a desired senior course, then they should plan to take the pre-requisite). Pre-requisite trees are complex in some subject areas, thus attention is being given to how they are visually represented. Initial plans are to present the trees on paper; further work will be needed to adapt them for accessible web use.

The Honours Science BSc program has included a requirement to complete: 4.0 lecture units at 300- or 400-level. Approval was obtained to change this requirement as of 2019/2020 to:

- 4.0 lecture units at 300- or 400-level, with 1.0 unit being at the 400-level

This change will ensure Honours Science students have successfully completed senior science training (during the review period, 87% of students completed at least one 400-level science course so this requirement will not notably increase the difficulty of the program yet it will bring it in line with many other Honours Baccalaureate programs).

The reviewers also suggested that the lab requirements be increased in both programs. This recommendation is not supported for the following reasons:

- The labs are resource-intensive and departments are at capacity
- While students in these programs must complete Year One laboratory courses in two Science subjects and can only count a limited number of lab courses toward their degree (1.0 unit for General Science and 2.0 units for Honours Science), a majority of students complete additional laboratory training. This happens because students:
 - Take laboratory courses out of interest
 - Complete laboratory training as part of other honours Science BSc majors before entering the General Science or Honours Science programs

- Choose lab-embedded courses (i.e., ones with both a lecture (LEC) and laboratory (LAB) component). These LEC/LAB courses are not immediately visible on the degree audit or transcript
- In a review of 2017 graduates in these two programs, the number of standalone or lab-embedded courses taken beyond the Year One lab courses was determined. There were 359 course enrolments among the 71 General Science graduates and 1,182 course enrolments among the 210 Honours Science graduates; these data indicate that, on average, graduates completed 5.5 additional lab-embedded or standalone lab courses (5.1 General Science; 5.9 Honours Science).

The Faculty of Science believes the students in these programs are obtaining sufficient laboratory training, thus additional laboratory requirements are not needed. In addition, the current requirements allow for the intended flexibility sought by the Faculty and the students in these programs; students choose the lab training that works for their skills and needs.

4. **Enrich the student experience for Canadian and international students to develop a community of learners:** Encouraging greater interaction between Canadian and international students will enrich the experience for both groups. Perhaps consider involving Canadian undergraduates in the English language training taken by international students before commencing their program in order to better integrate the two groups.

Response

The Student Engagement Officer and the Academic Advisor, International Students, along with the Manager of Faculty Relations from the Student Success Office (SSO) will consider activities that facilitate interactions among domestic and international science students. Possible opportunities include: creating domestic student volunteer opportunities during the [English For Academic Success \(EFAS\)](#) program for China-partner students; expanding or revising the Faculty of Science's ['Study Buddy' program](#) for international science students; and mixing domestic and international students in the new 25-seat ['Communication in the Sciences'](#) course that began in Fall 2018. The Fall 2018 and Winter 2019 offerings of this course are being studied in numerous ways (e.g., course grades, course grades relative to term grades, pass/fail rates, instructor reports of interaction, according to student citizenship status). Some initial key observations are:

- Only 1.4% of Science students failed the course, with no trend according to citizenship status.

- The average course grade according to citizenship was: Domestic 81, Permanent Resident 79, and Study Permit 77 (the difference between domestic and study permit students was statistically significant, yet in all three cohorts, the course grade raised their overall term average).
- Numerous instructors reported productive cross-citizenship interactions during class.

One way to facilitate volunteer participation is to count this activity toward an EDGE certificate for students in regular programs (e.g., General Science and Honours Science). This possibility will be explored with EDGE administrators.

The [Science Transition Coach](#) has been a new resource in the past 18 months to help students adjust to life at a Canadian university. An international Science graduate student is employed by the Science Undergraduate Office to provide part-time help to international Science Year One students.

- 5. Manage the student experience from admission to graduation by integrating functions in many areas currently available:** This process is already ongoing but continually working to integrate the efforts of the different groups working with students will improve the experience. Advising groups across campus meet monthly, but there are opportunities for more integration with the Library and the Writing and Communication Centre.

Response

The Faculty of Science's Student Success Officer and the Academic Advisor-Programs Specialist will consult with the Student Success Office's Faculty Relations Manager (FRM) to facilitate positive student experiences for General Science and Honours Science BSc students. The academic advisors for these programs already encourage students to connect with support units on campus. The new program-specific webpages will list the initiatives that are developed. Of note, Science-specific SSO workshops already garner better attendance than non-Faculty specific workshops, suggesting Faculty of Science students benefit from these support workshops.

The December 2018 creation of the Science Student Information Specialist position is helping Science strategically enhance student services. This position is primarily responsible for tracking and analyzing information related to Science students, including admissions, matriculation, academic progression, and graduation for the purpose of teaching, learning, and administrative strategic planning regarding undergraduate studies in the Faculty of Science. In addition, the Student Success Office and the Science Student Success Officer are developing targeted additional supports in the 1B term for at-risk Science students who have received a conditional or failed (FLG or FLH) standing in 1A

(many of these students have been involuntarily moved into the General Science or Honours Science BSc academic plan).

Planning is underway for a Fall 2019 pilot of a student support hub in the Science Undergraduate Office where a variety of guest service supports will be embedded a few hours per week (e.g., UW Mates, SSO Peer Success Coach, Science Coach, and CCA Career Advisor).

Finally, current renovations will allow Science-embedded counsellors from Counselling Services to move into the Science Undergraduate Office in Fall 2019; this move will provide more privacy for Science students seeking this service because the waiting area will no longer be in a major public corridor.

Implementation Plan:

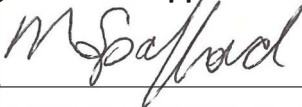
	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	Need for improvement of conveying and integrating information at all levels: website, Faculty of Science, service department pages	Develop new program-specific webpages	Science Manager, Academic Advising	Goal: Complete end of Spring 2019 An initial content update and reorganization of all Science UG webpages occurred by the end of Winter 2019. Work on program-specific pages for the reviewed programs is in progress, with an estimated completion date by the end of Winter 2020.
2.	Strengthen online course delivery as integral to program offerings in the Faculty of Science	Initiate incremental increase in online Science course offerings	Associate Dean of Science, Undergraduate Studies (in consultation with Dean and Science department chairs)	Goal: 1 course/18 months
3.	Provide program pathways that are inclusive of all students, including access to labs, course, and 400 level courses that are distinguished from 300 level courses.	Develop pre-requisite trees (for program-specific webpages)	Science Manager, Academic Advising Associate Dean of Science, Undergraduate Studies	Goal: Complete paper version by end of Spring 2019 (discussions begun for creating an online, accessible version). Goal: Incorporated into 2019-20 calendar year

		Add 400 level course requirement to Honours Science program		
4.	Enrich the student experience for Canadian and international students to develop a community of learners.	Investigate increased opportunities for domestic and international student interactions (e.g., volunteer, EDGE credit).	Science Manager, Academic Advising	Goal: Increase opportunities by end of Spring 2019
5.	Manage the student experience from admission to graduation by integrating functions in many areas currently available.	Investigate increased opportunities for positive student experiences.	Associate Dean of Science, Undergraduate Studies	Goal: Increase opportunities by end of Winter 2020

The Associate Dean of Science, Undergraduate Studies, in consultation with the Dean of the Faculty shall be responsible for monitoring the Implementation Plan.


Date of next program review: _____ 2024-2025
Date

Signatures of Approval:

 _____ January 29, 2019
Associate Dean of Science, Undergraduate Studies Date

AFIW Administrative Dean/Head (For AFIW programs only) Date

 _____ 30-1-19
Faculty Dean Date

 _____ March 2019
Associate Vice-President, Academic Date
(For undergraduate and augmented programs)

Associate Vice-President, Graduate Studies and Postdoctoral Affairs Date
(For graduate and augmented programs)