FINAL ASSESSMENT REPORT
Executive Summary
May 2017
Bachelor of Science in Biological Science
Program Review
Dean: Dr. Greg Crawford

Under UOIT's Quality Assurance Framework, all degree programs are subject to a comprehensive review every eight years to ensure that they continue to meet provincial quality assurance requirements and to support their ongoing rigour and coherence.

On the completion of the program review, the self-study brief together with the reviewers' report and the assessment team's response are reviewed by the appropriate standing committee of Academic Council, and are subsequently reported to Academic Council, the Board of Governors and the Quality Council.

In academic year 2015-2016 a program review was scheduled for the Bachelor of Science in Biological Science. This is the second program review for this program and the internal assessment team is to be commended for their thoughtfulness in linking the current review with that conducted in 2007-2008. The following pages provide a summary of the outcomes and action plans resulting from the review, identifying the strengths of the program as well as the opportunities for program improvement and enhancement. A report from the program outlining the progress that has been made in implementing the recommendations will also be put forward in eighteen months' time.

External Reviewers: Dr. Liette Vasseur (Brock University) and Dr. Michael Duffy (University of New Brunswick)
Site Visit: 13 -14 June 2016

The foundational areas of cell biology, genetics and molecular biology, physiology, biochemistry and developmental biology are mastered in the Biological Science program. Students can study within the broad scope of the Complementary Studies (unspecialized) stream, or choose to specialize in Environmental Toxicology, Pharmaceutical Biotechnology; or, for those interested in pursuing medical school or related health science careers, the Life Science Specialization. Specializations have common courses during the first two years, allowing for flexibility and transfer between them. Hands-on laboratory experience is also an important component in all specializations.

Significant Strengths of the Program

- Common core courses in the first two years
- 100% of the tenured research faculty hold NSERC Discovery Grants
- Biological Sciences faculty are tight-knit, clearly dedicated to the university mission and undergraduate education

- A rare 90% of the courses are taught by permanent staff
- Most courses are well described in terms of learning outcomes

Opportunities for Program Improvement and Enhancement

- Program requirements are somewhat rigid; students do not have the capacity to take many electives outside of the program
- Heavy reliance on on-line courses
- Majority of assessment occurs near the end of the term and practical assessment/proficiency development/testing is lacking
- The positive features of the program and supports at the university are not well communicated prior to student enrolment

The External Review

The site visit took place on June 13 and 14, 2016. The reviewers met with members of the Faculty as well as key stakeholders at the University. The Faculty was grateful for the thoughtful and thorough review provided. The external reviewers recognized the high quality of the faculty, the rigorousness of the program and the use of cutting-edge technologies on laptops and in the laboratories. The reviewers identified 11 recommendations, some of which have multiple components.

Summary of Reviewer Recommendations and Faculty Responses

Recommendation 1

The motto of the university is "Challenge-Innovate-Connect". We believe that this can be used as a promotion tool and as a way to better integrate students starting on their first day at UOIT. The students can be challenged through the use of proficiency assessments in their first year. These assessments can be in the areas of writing, communication, math, and technical skills (e.g. safe pipetting, micro-pipetting, etc.). Students can innovate as they become more efficient in using technologies, knowledge and skills in their courses and labs, and through research experiences as volunteers, research assistants, or Honours. They have the capacity to connect again through research activities as well as COOP where they can be connected to the workplace. We should also not forget the power of the teaching assistants in connecting the students to potential research projects, faculty and opportunities for future graduate studies. One word can be added strategically to help build your program and even to help recruit and retain students: confidence. Using minor refinements to the existing program can better "Challenge Innovate Connect" students and instill confidence through demonstrated proficiency so that they are better prepared for the marketplace or graduate studies.

Response

The reviewers' recommendations here represent an effort to align the educational experience with UOIT's core philosophies. The faculty note that institutional mottos can change however they will consider the extent to which they profile the ways in which biology students "Challenge-Innovate-Connect", including learning outcomes and assessments that can be tied to this motto.

Recommendation 2

While it is remarkable to see the program being very well structured, this does not give the opportunity to students to experience fully a university system as a place of higher learning. It is expected that during their stay at university, they would develop not only skills and competencies in a specific discipline but

also explore and develop other aspects of their knowledge. Much of this knowledge is to come from other disciplines such as social sciences, humanities, etc. We recommend that the program examine the possibility of making the program somewhat more flexible by reducing mandatory courses in favour of allowing students to take courses in other programs. It may add flexibility in the upper years of the program where there are already some challenges with the diversity of electives in Biology. This aligns well with one mission of the university to "Foster a fulfilling student experience".

Response
This recommendation is well-aligned with a current Faculty priority. As part of the Faculty's strategic unit plan, they are currently conducting a broad review of the undergraduate science curricula with a view to: (i) reducing the number of courses required in majors and minors, to allow students to more easily complete a major and minor in approximately four years; (ii) reducing the number of course offerings (e.g., removing low-enrollment classes and/or offering some courses every other year); (iii) reallocating savings to provide course releases for faculty to support enhanced research productivity. The intention is to enhance flexibility for students and reallocate resources.

Recommendation 3
The program should have an open discussion on the balance of lectures, on-line and hybrid courses to ensure that quality teaching is maintained. It is important to acknowledge that on-line courses are often more demanding in terms of time than lecture courses as students tend to work outside of class time (evenings/weekends).

Response
The program faculty are committed to reflecting on the current distribution of delivery modes among courses in relation to perceived student needs and resource constraints and opportunities. The Faculty notes the following: (1) currently, 80% of courses (24 of 30) are delivered in a face-to-face format; (2) we are largely a commuter campus; (3) we are very thoughtful about the differences between face-to-face and online/hybrid course delivery, particularly in terms of effective teaching and learning.

Recommendation 4
The program should ensure that BIOL3010U (Laboratory Methods in Molecular Biology) is taught at the same time as BIOL4040 (Applied Molecular Biology). In this way, students would follow better with theory and practice and this may reduce the time required by students in understanding the lab material. If this isn't possible due to scheduling challenges, perhaps BIOL4040 could be taken before BIOL3010, thereby providing another lab opportunity in their final year.

Response
The plan is to convert BIOL3010 to a 4th year course and make BIOL4040 a prerequisite. This may require some modifications to the learning outcomes of BIOL4040 or the removal of BIOL4040 completely and replacement with a new 4th year course.

Recommendation 5
The program should work with the Dean and the university to find a space that could serve as a lab for courses that currently do not have a lab component. Practical skill development in these courses is very important and most universities will have labs associated with those courses.

Students made specific requests for more laboratory opportunities in the program. Absence of a Biochemistry lab is notable and would seem to be uncommon at most universities. Perhaps this content is distributed among other courses.

Response
The Faculty will review the distribution of labs across courses. For context: (1) 13 of 40 courses in the biology degree have a lab component; (2) these are mostly concentrated in 1st through 3rd Year (currently considering whether or not a few of the 3rd year lab courses should be moved to 4th year); (4) top students can apply to participate in a two-semester Honours thesis in 4th year, which almost always involves additional laboratory experience. The program is also consider whether or not to add an additional lab experience course option, much like the Chemistry program recently added.

Recommendation 6
Early assessment of the students may help to retain some of them in the program. We recommend that lab skills and knowledge be tested earlier in the semester. The heavy reliance on final tests and exams does not help assess student's acquisition of knowledge and skills. Proficiency tests do not have to be extensive but they are key to a student developing laboratory competence and confidence. As it was discussed during the visit, it is one thing to practice but another thing to demonstrate that the student has acquired proficiency with a specific skill.

Response
The faculty will be examining lab curriculum to identify potential ways for students to get the most out of these sessions. Student assessment in the labs currently occurs throughout the term. The faculty strongly support a Biology Foundations course offered in the first semester which can focus on many of the key skills (measurement, data analysis, communication, hypothesis testing) needed to succeed. A foundations courses would replace the one of the current MATH courses (see below) which would not only allow delivery of critical material that cannot be adequately covered in existing courses or labs but provide flexibility to introduce new content based on changing needs of incoming students.

Recommendation 7
We were very surprised to learn that when a student missed a mid-term exam, the marks were transferred to the final exam rather than offering a deferred mid-term exam. We strongly recommend changing this practice. We found that final exams in many courses were already worth a high percentage of the grade (and many were cumulative). Such a practice may also induce anxiety and contribute to the transfer of students to other programs at UOIT, or even to other schools.

Response
The program will be discussing options related to this recommendation. One alternative possibility is to redistribute the marks associated with a missed mid-term exam across the entire remaining set of (non-lab) assessments, including quizzes, homework assignments, other mid-terms and the final exam.

Recommendation 8
With the phasing out of the computer fees, there may be an opportunity to introduce a "lab consumables" fee for teaching labs. The fee can be small (e.g. $20 per lab) and attached to the use of consumables such as chemicals. The rationale is that currently your equipment is well maintained and relatively new. However, it is expected that maintenance costs and the need for additional equipment will increase over time. This means that a maintenance and replacement schedule should be developed

so the program is not strained when this happens inevitably. Facilities and resources are a definitive strength and should be maintained by the program to ensure that you retain that competitive edge.

Response
The Dean has requested a new line in the Faculty budget to help cover equipment maintenance and replacement costs. The University budget for 2017-18 has been approved. Discussions related to this are ongoing.

Recommendation 9
This recommendation can be divided into two parts. The first part relates to the replacement in the near future of the Tier 1 CRC. It is essential for the program and the university to start the process soon to make sure that UOIT retains the CRC position, and preferably in the same field considering the investment already made by the university in the aquatic toxicology fish facility and teaching specialization. This is a very strategic field of research, it distinguishes UOIT from other universities, and this aligns well with one mission of the university to "advance the highest quality of research". The second part is for the program to start discussion of its future and the schedule of personnel replacement considering the possibility that many people could leave at the same relative time. This is important for the continuity of the program and for maintaining its quality.

Response
The Faculty will be allocated a replacement CRC. The Faculty notes that succession planning for the program seems to be much less of an issue at this point. Given the relatively young age of the university and faculty, high attrition is unlikely in the next 15-20 years.

Recommendation 10
Knowing how students feel about the program and the unfortunate decline in the number of first year students, it is critical for the program and the university to work together in better profiling the program. The current students are great ambassadors in this regard. They had very good comments about your program as outlined in this report. We feel that this is an urgent matter that will require some spending on advertising but with opportunity for rapid simple payback.

Response
This recommendation is in alignment with the recently-developed Faculty strategic plan. The Faculty is currently involved in a number of target recruiting efforts, including: high school Science Days (bringing students from Durham high schools to campus twice a year); the development of a STEM workshop for girls in the Durham Region, in collaboration with the local school board; the development of an additional workshop and other materials for a STEM-based recruiting event in the Peel District.

Recommendation 11
The program and the Faculty of Science must work together with the university to develop policies and documents to allow faculty members and associated organizations to have volunteer students working in their labs. This is a normal and common practice in universities and is a very positive experience for the students. This is often where they can really develop their skills and decide whether they want to go to graduate studies. Policies and documents are available in many universities and so there is no need to develop these from scratch. This should be implemented immediately to foster a better training environment.

Response

A draft proposal based on this recommendation has been developed by the Faculty of Science. It has been forwarded to the Office of Research Services for review and further development.

Plan of Action

The table below presents a timeline of the actions planned to address the recommendations from the external report.

Proposed Action	Timeline	Person/Area Responsible
Complete a curricular review, with recommendations and assessments of numbers of section reductions submitted to Dean and Faculty Council	Summer 2017	Program faculty, in consultation with the dean
Review distribution of traditional, online and hybrid course offerings and revise if necessary	December 2017	Program faculty
Convert BIOL 3010 to a 4th year course, make BIOL 4040 a prerequisite	December 2017	Program faculty
Review distribution of lab course offerings across the curriculum and assess any new opportunities for additional in-course experiential learning	December 2017	Program faculty
Seek additional funding to support lab consumables / instrument maintenance and replacement	May 2017 (update)	Dean
Development of a Biology Foundations course/revision of Math course requirements	December 2017	Program faculty, in consultation with Dean and Math program director
Review policy options for missed mid-terms	December 2017	Program faculty
Review recruitment strategies	December 2017 (update)	Program faculty
Review progress on developing volunteer policy	December 2017 (update)	Dean, in consultation with other university stakeholders

Due Date for 18-Month Follow-up on Plan of Action: February 2018
Date of Next Cyclical Review: 2023-2024