CARLETON UNIVERSITY COMMITTEE ON QUALITY ASSURANCE
Cyclical Review of the undergraduate programs in Computer Science
Executive Summary and Final Assessment Report

This Executive Summary and Final Assessment Report of the cyclical review of Carleton's undergraduate programs in Computer Science are provided pursuant to the provincial Quality Assurance Framework and Carleton's Institutional Quality Assurance Process (IQAP).

EXECUTIVE SUMMARY

The undergraduate programs in Computer Science reside in the School of Computer Science, a unit administered by the Faculty of Science.

As a consequence of the review, the programs were categorized by Carleton University's Senate Quality Assurance and Planning Committee (SQAPC) as being of good quality. (Carleton's IQAP 7.2.13).

The External Reviewers' report offered a very positive assessment of the programs. Within the context of this positive assessment, the report nonetheless made a number of recommendations for the continuing enhancement of the programs. These recommendations were productively addressed by the Director of the School of Computer Science and the Dean of the Faculty of Science in a response to the External Reviewers' report and Implementation on Plan that was submitted to SQAPC on May 27th, 2021.

School of Computer Science

Unit Response to External Reviewers' Report & Implementation Plan
Computer Science B.C.S. Honours
Computer Science B.C.S. Major
Version: May 19, 2021

Introduction & General Comments

In February 2021, the School of Computer Science was pleased to receive the very positive External Reviewers' report. This report was shared with our faculty and staff. In the School of Computer Science, we are committed to the continual improvement of our B.C.S. programs to enhance the student, staff, and faculty experience. This document contains both a response to the External Reviewers' Report and an Implementation Plan, which have been created in consultation with the Dean(s).

For each recommendation one of the following responses has been selected:

Agreed to unconditionally: used when the unit agrees to and is able to take action on the recommendation without further consultation with any other parties internal or external to the unit.
Agreed to **if additional resources permit:** used when the unit agrees with the recommendation, however action can only be taken if additional resources are made available. Units must describe the resources needed to implement the recommendation and provide an explanation demonstrating how they plan to obtain those resources. In these cases, discussions with the Deans will normally be required and therefore identified as an action item.
Agreed to in principle: used when the unit agrees with the recommendation, however action is dependent on something other than resources. Units must describe these dependencies and determine what actions, if any, will be taken.
Not agreed to: used when the unit does not agree with the recommendation and therefore will not be taking further action. A rationale must be provided to indicate why the unit does not agree (no action should be associated with this response).

Response to External Reviewers' Report Committee (review committee)

The response to the external reviewers' report was prepared by a committee comprising the following members:

Michel Barbeau, Director
Mark Lanthier, Associate Director Undergraduate
Christine Laurendeau, Associate Director (Recruitment/Outreach)

UNIT RESPONSE AND IMPLEMENTATION PLAN

Programs Being Reviewed: Computer Science B.C.S. Honours and Computer Science B.C.S. Major

Prepared by: Michel Barbeau, Director, School of Computer Science and review committee

External Reviewer Recommendation & Categorization	Unit Response: 1- Agreed to unconditionally 2- Agreed to if additional resources permit (describe resources) 3- Agreed to in principle 4- Not agreed to Rationales are required for categories 2, 3 & 4	Action Item	Owner	Timeline	Will the action described require calendar changes? (Y or N)
Retention: The relatively high dropout between first and second year is of concern. We think a survey of upper B.C.S. students and students who did not continue a B.S.C. will help in identifying the causes of the high dropout between first and second year.	*1. Agreed to unconditionally*	*The School of Computer Science will develop and implement an online exit questionnaire for the B.C.S. (students who graduated, students who withdrawn). A person will be hired to develop and implement the questionnaire. The questions will be prepared in consultation with the Director and Associate Directors.*	*Director*	*2021*	*N*
Administrative Support: A number of advising, communications, and outreach challenges can be addressed through additional administrative support. When compared to comparable programs, there is evidence that additional full-time administrative positions are justified given the growing enrollments and popularity of the SCS undergraduate programs.	*1- Agreed unconditionally*	*The School of Computer Science recently hired a new temporary undergraduate advisor. For the upcoming academic year, a request has been put in the budget for transforming the temporary position to a permanent one.*	*Director*	*Spring 2021*	*N*
Space: Given the significant growth that the SCS undergraduate programs are attracting, as well as the new stream being launched, it seems that more space is necessary. A third-party that does a space audit could identify the requirements for quality space to strengthen the learning and teaching environments for the growth	*2- Agreed to if resources permit*	*At the university level, a space audit has been conducted by a consultant firm, in relation to upcoming Herzberg renovations. The allocation of space is being reviewed and discussed with the Dean of the Faculty of Science.*	*Director*	*Before return to campus*	*N*

the SCS programs are experiencing.					
Communications: Students expressed concern with insufficient information regarding requirements for online platforms and approaches employed. They were unsure of how to deal with the reliability issues of cloud services and systems based on virtual machines. The students thought that there was a need to standardize the online tools/platforms so that students would feel less overwhelmed. They also raised concerns regarding the 'bring your own device policy'. In particular, the need for alternatives for the students who do not have a reasonable device for learning and teaching purposes.	*2- Agreed to in principle* *We believe this problem was particularly present at the beginning of the pandemic.*	*1. Students expressed concern with insufficient information regarding requirements for online platforms and approaches employed:* *All of our Openstack documentation and virtual machine documentation has been standardized to make it easy to use (with the help of TAs and students). Both cloud and virtual machine technologies have step-by-step guides that go through all the basics, and includes video tutorials.* *2. Students were unsure of how to deal with the reliability issues of cloud services and systems based on virtual machines:* *The School of Computer Science Technical Staff can help with general technical issues related to the use of school technical facilities. Several of our instructors run their course resources on our Openstack, but within their Openstack instances the run other cloud software to provide either custom instances or containers. They run other cloud software to provide either instances or containers. They are only using Openstack to get CPU time, not for the actual end-user technology. When a student needs support related to course-specific technical issues, then they can*	*Director*	*N/A*	*N*

		contact course Teaching Assistants and course Lab Coordinators. We have a web page that details this information. Furthermore, during their beginning of term orientation, first year students meet Technical Staff representatives and are informed about available resources, including clouds services and virtual machines, and how to get help in case of difficulty. *3. The students thought that there was a need to standardize the online tools/platforms so that students would feel less overwhelmed:* *All of our supported images are standardized across Virtualbox and Openstack, but some faculty use custom images and containers to support their course requirements.* *Regarding the 'bring your own device policy', we have two undergraduate labs (HP4115 and HP4155) with 150 desktop computers available. We plan to maintain these labs until the' bring you own device policy' has been validated and meets the accessibility needs of students. The long-term objective is for all students to bring their own personal computer, while the School of Computer Science will offer resources that students cannot afford such as cloud storage and computing, parallel computing platforms and graphics processing units.*			

TA Support: Students felt that they need more TA support especially from the second year onwards. We think that TA selection process could be revised to address these concerns. In addition, TA jobs could be fulltime/professional for hiring individuals with the necessary skills to give tutorials and support learning for the undergraduate students.	*2- Agreed to if resources permit* *The TA selection process is constantly improving. We try to hire the best possible TAs. However, finding TAs for upper year courses is particularly challenging. There are not enough candidates. We do organize a TA orientation session every year. TA orientation material is updated every term to address common issues raised by students. The material reviewed as part of the responsibility of the Associate Director Undergraduate, in consultation with the School Administrator and Lab Coordinators*	*The Faculty of Science can grant the School the budget required to hire as many TAs as required. However, the challenge is finding qualified individuals to assume TAships.* *To address TA support, we wish to explore the possibility of replacing student-TAs by permanent staff members, at least for certain courses. The goal is to improve the quality of teaching assistantship we deliver to our undergraduate students. The education assistant will be involved in tutorials, labs and marking. This is a new type of position for the School of Computer Science, that does not match the job description of lab coordinators. The exact job description for education assistant remains to be defined. In the upcoming academic year, we would like to develop the concept with a one-year term position and for one course (COMP 3004). If funding is available, we will hire an Education Assistant to cover one of our large core courses (COMP 3004) for one year, to test and evaluate the concept.*	*Associate Director Undergrad*	*Ongoing*	*N*
Program Size: There is potential to increase the breadth and size of the SCS undergraduate programs with participation of other units. These may include Business, Engineering, Science and Social Sciences. This may also provide more inter-disciplinary streams and research to respond to	*3- Agreed to in principle* *We are currently running at full capacity, if not over capacity. We temporarily closed the minor in CS and definitely closed the Mobile Computing Stream and Network Computing streams (effective Fall 2022), because of their relative low enrolment and the need to*	*Consider participation of other units.*	*Associate Director Undergrad, Curriculum committee*	*Ongoing*	*N*

"needs of society today and anticipate the needs of the future".	*efficiently use our limited resources. Few years ago, we closed multidisciplinary streams (Biomedical Computing, Psychology) for the same reasons. We are not opposed to reconsidering this recommendation in the future if resource conditions change.*				
Equity: Further demand for the program may be achieved with more promotion, communication, and outreach. Different streams in Computer Science are attractive to a wide range of backgrounds and can help increase diversity. An increased pool of applicants would strengthen the SCS programs and respond to "needs of society today and anticipate the needs of the future".	*3- Agreed to in principle* *We agree with the importance of attracting students with range of backgrounds and increase diversity. We are already moving in this direction.*	*The School of Computer Science is committed to continuous progress towards full participation in our programs for all groups of individuals. Everyone should feel welcome to apply and join our programs. We need all perspectives and all viewpoints.* *In the School of Computer Science, moving towards gender equity is a priority. Carleton's Faculty of Science, comprising the School of Computer Science, has planned, and started initiatives to help encourage and support female students, and to address gender imbalance at the graduate level. These initiatives include the ACE (Awareness, Collaboration and Engagement) EDI event series, development of inclusivity training to the faculty, inclusive hiring practices and outreach visits to elementary and high school classrooms by female scientists and professors and by inviting students to university labs. The School of Computer Science has its own EDI committee. Current activities include the design of computer science specific EDI statements, inclusive computer science teaching, hiring policies, student code of conduct and a*	*Associate Director (Recruitment/Outreach), Undergraduate Recruitment Committee*	*Ongoing*	*N*

		research project to develop teaching and mentoring approaches aiming to significantly improve experience for students from under-represented minorities in computer science. *We run an outreach program to get young children (especially girls) excited and engaged in technology; primarily computer science (i.e., digital literacy). There are two components to this: 1. A weekly/monthly program at an elementary school in the region. Sir Winston Churchill would be the initial school to start the program. 2. Set up repeated, monthly, teaching event (computing literacy, basic programming) for elementary school teachers so that they can take this back to their school to start up coding clubs.* *We support societies that encourage women in computer science, including Women in Computer Science (WiCS), Women in Science and Engineering (WISE) and Tecnolgap.* *Furthermore. We run a research project on Understanding and Increasing Diversity in Computer Science. The long-term goal is to improve our computer science programs and we wish to take an evidence-based research approach to understand the problem and assess the impact of any changes we undertake. With this project, we will collect baseline data through observation, surveys,*			

		interviews with students, TAs, staff, and faculty to assess our programs, then we will devise and implement strategies for improving retention, equity, diversity, and inclusivity within Computer Science at Carleton.			
Domestic and International Students**:** While the demand is high for the SCS undergrad programs, there is room to grow in out-of-province domestic high school students as well as international high school students. These would strengthen Ontario student exposure to other Canadian and non-Canadian issues.	*2- Agreed to in principle* *We agree with this, but out-of-province recruitment is handled by the university recruitment office. Departments are not directly involved in out-of-province recruitment.*	*The School is indeed recruiting very few students from other provinces. More efforts can be put in that direction. They need to be coordinated with the help of the university Undergraduate Recruitment Office.*	*Associate Director (Recruitment/Outreach), Undergraduate Recruitment Committee*	*Ongoing*	*N*