

BSc. in Computer Science
Update on Learning Outcomes Assessment Activities
Programs Being Reviewed: Undergraduate Programs
Completed by: Michel Barbeau, School of Computer Science
Dean Approved by Maria DeRosa on October 6, 2022

1. Who is responsible for the assessment of program learning outcomes?

- Learning Outcomes Assessment Committee
- Undergraduate/Graduate and/or Curriculum Committee(s)
- All faculty in unit
- Other:

2. Which program learning outcomes have been assessed since the last CPR? (*list the learning outcome statements, or abbreviated versions, below*)

LO1: Design and implement programs in any domain of application using established software engineering concepts, techniques and environments

3. What methods have been employed to assess the program learning outcomes? (*check all that apply*)

- Reviews of examples of student work
- cuPortfolio
- Student surveys or focus groups
- Faculty retreats or discussion sessions
- Reviews of program curricula and courses (*includes efforts to align course and program learning outcomes*)
- Other _____

4. Provide a brief description of the assessment activities undertaken since your last CPR Review.

LO1 is highly related to the course COMP 1405 Introduction to Computer Science I, at the introductory level. This is an important course for the program and a special committee was put in place to conduct the assessment, including curriculum committee members, COMP 1405 instructors, and other interested faculty members. The detailed LO criteria for the course have been assessed and reviewed. This has led to a course content review and an updated calendar description.

The bulk of the efforts has been put into COMP 1405. To fully complete the assessment of the LO criteria, LO1 remains to be examined with respect to two reinforcement courses, namely, COMP 1406 Introduction to Computer Science II and COMP 2406 Fundamentals of Web Applications; and one mastery course, namely, COMP 3005 Database Management Systems.

5. What assessment activities will be undertaken between now and your next CPR? When will these be implemented?

Our next CPR will be conducted during the 2023-24 academic year. The assessment of *LO1* will be completed. The assessment of *LO 2: Analyze and compare the time and space complexity of solutions to computing problems* will be undertaken.

School of Computer Science
Update on Unit Response to External Reviewers' Report & Action Plan
Programs Being Reviewed: BCS Honours, BCS Major in Computer Science
Completed by: Michel Barbeau, Director
Approved by Dean: Maria DeRosa on October 6, 2022

Note: This document is made available for public posting on the Vice- Provost's website.

***** Denotes items that SQAPC would like the unit to pay particular attention to based on their past review of the original action item.**

External Reviewer Recommendation	Original Action Item	Owner & Timeline	Progress Update September 2022	Will the action described require calendar changes? (Y or N)
<p>***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.</p>	<p><i>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.</i></p>	<p><i>Director 2021</i></p>	<p>The exit questionnaire has been developed and implemented. It went live in September 2022.</p> <p>They are available here:</p> <ul style="list-style-type: none"> Exit Survey Bachelor of Computer Science (BCS) Students – Graduated: https://carletonu.az1.qualtrics.com/jfe/form/SV_cGDxWs8Eh4eqkKg Exit Survey Bachelor of Computer Science (BCS) Students – Withdrawn: https://carletonu.az1.qualtrics.com/jfe/form/SV_3QKEybeoGV879SS 	<p>N</p>
<p>***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.</p>	<p><i>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.</i></p>	<p><i>Director Spring 2021</i></p>	<p>The School of Computer Science has been granted a new regular Undergraduate Advisor position. The position had been posted and a person has been hired (October 2021) to fill the position. We currently have two full-time regular Undergraduate Advisors to support the students in our programs.</p>	<p>N</p>

<p>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 the SCS programs are experiencing.</p>	<p><i>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.</i></p>	<p><i>Director Before return to campus</i></p>	<p>A space audit has been conducted by an independent consultant. Unfortunately, very little additional space has been identified. Space is still an ongoing issue. A long-term solution needs to be fleshed out.</p>	<p>N</p>
<p>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.</p>	<p><u><i>1. Students expressed concern with insufficient information regarding requirements for online platforms and approaches employed:</i></u></p> <p><i>All of our <u>Openstack documentation</u> and <u>virtual machine documentation</u> 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.</i></p> <p><u><i>2. Students were unsure of how to deal with the reliability issues of cloud services and systems based on virtual machines:</i></u></p> <p><i>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 contact course Teaching Assistants and course Lab Coordinators. We have a <u>web page</u> that details this information. Furthermore, during their beginning of term orientation, first year students meet Technical Staff representatives and are informed about</i></p>	<p><i>Director- N/A</i></p>	<p>No further action is required other than regularly updating the documentation.</p>	<p>N</p>

	<p><i>available resources, including clouds services and virtual machines, and how to get help in case of difficulty.</i></p> <p><i>3. <u>The students thought that there was a need to standardize the online tools/platforms so that students would feel less overwhelmed:</u></i></p> <p><i>All of our supported images are standardized across Virtualbox and Openstack, but some faculty use custom images and containers to support their course requirements.</i></p> <p><i>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.</i></p>			
<p>TA Support: Students felt that they need more TA support especially from the second year onwards.</p> <p>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.</p>	<p><i>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.</i></p> <p><i>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</i></p>	<p><i>Associate Director Undergrad - Ongoing</i></p>	<p>Finding qualifies TAs remains a challenge.</p> <p>The possibility of replacing a group of TAs by a permanent staff member is still being considered. A similar job does exist in the School of Mathematics and Statistics. The job is called Learning Assistant. However, finding a qualified individual to fill in that job in computer science is challenging, given the highly competitive market currently experienced in the field.</p>	<p>N</p>

	<i>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.</i>			
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 “needs of society today and anticipate the needs of the future”.	<i>Consider participation of other units.</i>	<i>Associate Director Undergrad, Curriculum committee-Ongoing</i>	We would love to do more, but current undergraduate enrollment is extremely high. This Fall 2022, we have a growth of 30% in the first year registered. We cannot really engage in numerous other projects at this time, given our limited resources.	N
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”.	<i>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.</i> <i>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 research project to develop teaching and mentoring approaches aiming to significantly</i>	<i>Associate Director (Recruitment/O outreach), Undergraduate Recruitment Committee-Ongoing</i>	Ongoing	N

	<p><i>improve experience for students from under-represented minorities in computer science.</i></p> <p><i>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.</i></p> <p><i>We support societies that encourage women in computer science, including Women in Computer Science (WiCS), Women in Science and Engineering (WISE) and Tecnolgap.</i></p> <p><i>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.</i></p>			
<p>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.</p>	<p><i>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.</i></p>	<p><i>Associate Director (Recruitment/O outreach), Undergraduate Recruitment Committee-Ongoing</i></p>	<p>Overall, the number of first-year “Other Canada” registered students in our B.C.S. programs is stable at 3%. However, given the phenomenal growth in first-year enrolment in the B.C.S. programs, there is significant growth of registered “Other Canada” students (estimated to be 21 for Fall 2022, a growth of 25%).</p>	<p>N</p>

