University of Lethbridge

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TO: Mike Mahon
President and Vice Chancellor

DATE: September 27, 2016

FROM: Alan Siaroff
Chair, Academic Quality Assurance Committee

RE: Computer Science Academic Quality Assurance Review

In accordance with the U of L *Academic Quality Assurance Policy and Process*, the Academic Quality Assurance Committee approved the review of Computer Science at its September 22, 2016 meeting.

The Self Study Committee for this review comprised Yllias Chali (Program Review Coordinator), Howard Cheng, Wendy Osborn, and Robert Benkoczi. The review produced four documents:[1]

1. *Department of Mathematics & Computer Science: Computer Science Self Study Report* (received March 1, 2016) – Self Study Report, developed by the Computer Science Self Study Committee.
2. *External Reviewers' Report on the Computer Science Programs, Department of Mathematics and Computer Science, University of Lethbridge, April, 2016* (received April 29, 2016) – External Review Report by Sheridan Houghten (Brock University) and Carey Williamson (University of Calgary) based on their site visit of April 5-6, 2016.
3. *Program Response on the Computer Science Programs* (received May 20, 2016) – response of the Self Study Committee to the external review.
4. *Dean's Response* (received September 12, 2016) – response to the review, written by Craig Cooper, Dean of the Faculty of Arts and Science.

[1] All documents are available upon request.

Self Study

The Self Study Report summarized the strengths, weaknesses, opportunities, and threats for Computer Science:

Strengths:	1. Instruction in the undergraduate courses is of a high quality. 2. The undergraduate program aligns with those at many other universities. 3. Faculty are committed to excellence in teaching and research. They have a high level of research and publication and have been successful in securing external research grants. 4. Students are satisfied with the quality of education they received in Computer Science. 5. Students have gone on to successful careers, with an employment rate of almost 100%.
Weaknesses:	• Computer science is an evolving field and it is difficult to keep the curriculum current. • Females are underrepresented in both students and faculty.
Opportunities:	• Designing programs with several entry points may attract more students, especially female students. • A growing graduate program will contribute more to the U of L mandate as a comprehensive academic and research institution.
Threats:	• A small faculty complement makes it difficult to compete with bigger schools to attract students and to maintain a variety of course offerings. • Computer Science lacks a world-class research chair. • Faculty members receive no credits for graduate-related activities like supervision and thesis examination.

The report had two main recommendations:

1. Hire a new faculty member who is a research chair in a cutting-edge area of computer science.
2. Hire a computer science instructor to teach lower-level courses.

There were nine questions for the External Reviewers:

1. How can a program with multiple entry points be designed?
2. Are there any missing streams from the undergraduate program?
3. Should the undergraduate program include more courses related to information technology and web technology?
4. Is the program meeting employer demands?
5. What are your thoughts on the M.Sc. program?
6. What are your thoughts on the Ph.D. program?
7. How can more Ph.D. computer sciences students be attracted?
8. How can students from underrepresented groups be attracted to the program?
9. What are some suggestions for improving the undergraduate and graduate programs?

The Self Study concluded with several reflections:

- A Canada Research Chair position in Computer Science would increase program prestige, bring the program more expertise and funding, and attract high quality graduate students.
- Hiring more faculty would both help replace lost positions and diversify the areas covered by the undergraduate and graduate programs.
- A dedicated computer science instructor is needed, to teach some lower level courses and to supervise Teaching Assistants.
- A dedicated system administrator is needed to maintain computer systems for teaching and research purposes.
- Enrolment of female students is quite low compared to national averages.
- There is currently only one program pathway into the computer science program, due to lack of resources to offer more.
- The service course should be redesigned so that its purpose is clear.
- Graduate student supervision should be accounted for more fairly in faculty workload.
- The graduate program needs a reasonable funding package to attract quality students.
- More effort is needed to attract local students to the graduate programs and to attract more Ph.D. students.

External Review

Overall, the External Review Report noted that Computer Science is delivering a quality program in spite of many challenges from limited resources. The report summarized the strengths and weaknesses of the Computer Science programs, and had several recommendations for improvement:

Strengths

- The undergraduate curriculum is in close alignment with the Association for Computing Machinery / Institute of Electrical and Electronics Engineers Computer Society (ACM/IEEE CS) 2013 guidelines.
- The program has an active cooperative education option.
- Graduates have high employment rates.
- Students are satisfied with the quality of instruction and supervision they receive.
- There is a growing graduate program.
- The program has emerging clusters of research strength.
- The program has programming contest teams that can compete at the international level.
- There are solid undergraduate program offerings and growing undergraduate enrollments (about 250 students currently).
- A large proportion of faculty members hold external research grants and there is a positive research culture.
- There is a solid core of faculty who are committed to the program and its students.
- The degrees are well recognized locally and nationally.

Weaknesses

- There is a low number of academic staff, barely adequate to staff the required course offerings.
- Faculty have high teaching workloads.
- The Department has limited control over budgetary matters (especially related to graduate student funding), and does not have a small discretionary budget.
- Faculty have a modest research profile.
- There is low female enrolment.
- The curriculum is somewhat entrenched in traditional areas at the expense of emerging application areas of computer science (e.g., computer security, networking, mobile computing).
- The number of graduate-level courses is limited by the small academic staff complement.
- Of the ACM/IEEE CS 2013 curriculum, the only area lacking in the Department's curriculum is software engineering.
- The teaching lab in adequate but somewhat outdated, with no Windows or Apple environments.
- Graduate course offerings are limited and graduate courses are taught in shared lectures for graduate and undergraduate students, which limits the depth of exploration for graduate students.
- Faculty members have relatively few interdisciplinary collaborations.

Recommendations

1. Seek greater clarity on target enrollments for graduate-level education and research.
2. Promote the Computer Science minors in the digital humanities and life sciences.
3. Add at least two new faculty members: an Assistant Professor (in Human-Computer Interaction, Graphics, or Computer Security); and a Canada Research Chair (e.g., in Data Science).
4. When resources allow, reinstate the requirement for a third-year software engineering course.
5. Consider adding a new lab with Windows or Apple computers.
6. Develop a succession plan for the Computer Science teaching and research lab support positions.
7. Grow the graduate program carefully, as financial resources permit.
8. Increase the range of graduate course offerings when teaching resources permit.
9. Consider developing a Teaching Assistant mentoring program to help incoming graduate students with this role.
10. Reduce the GLER requirements in the undergraduate programs so students can add more math, computer science, or science electives.
11. Increase the range of fourth-year course offerings when teaching resources permit.
12. Give the Department an annual discretionary budget for minor operational purchases and an annual budget for computer purchases.
13. Develop a space plan for the relocation of the Department in 2020.
14. Before the relocation in 2020, investigate the creation of a separate Department of Computer Science.

Program Response

In their Program Response, the Self Study Committee noted that they agree with the recommendations from the External review report, and had some commentary on specific recommendations:

Recommendations:	Program Response:
3. Add at least two new faculty members: an Assistant Professor (in Human-Computer Interaction, Graphics, or Computer Security); and a Canada Research Chair (e.g., in Data Science).	This a key recommendation that will enable the implementation of recommendations 4, 7, 8, and 11.
5. Consider adding a new lab with Windows or Apple computers.	This will require additional hardware and personnel. Computer Science will strike a committee to study the benefits of multiple types of computers and the attendant costs of hardware, software, and personnel.
1. Seek greater clarity on target enrollments for graduate-level education and research. 10. Reduce the GLER requirements in the undergraduate programs so students can add more math, computer science, or science electives. 12. Give the Department an annual discretionary budget for minor operational purchases and an annual budget for computer purchases.	These recommendations can only be addressed with the participation of the Faculty of Arts and Science, the School of Graduate Studies, and the entire university community.
2. Promote the Computer Science minors in the digital humanities and life sciences. 6. Develop a succession plan for the Computer Science teaching and research lab support positions. 9. Consider developing a Teaching Assistant mentoring program to help incoming graduate students with this role.	These recommendations can be addressed starting Fall 2016.
13. Develop a space plan for the relocation of the Department in 2020. 14. Before the relocation in 2020, investigate the creation of a separate Department of Computer Science.	These recommendations can be implemented in the next two to three years.

Dean's Response

In his response Craig Cooper, the Dean of Arts and Science, commented on the External Review Report recommendations and the Self Study Committee's response to these recommendations:

Recommendations:	Dean's Response:
1. Seek greater clarity on target enrollments for graduate-level education and research.	The Faculty of Arts and Science will discuss graduate enrolment as it develops its own strategic plan.
2. Promote the Computer Science minors in the digital humanities and life sciences.	Agreed.
3. Add at least two new faculty members: an Assistant Professor (in Human-Computer Interaction, Graphics, or Computer Security); and a Canada Research Chair (e.g., in Data Science).	This will require additional resources, which is a challenge.
4. When resources allow, reinstate the requirement for a third-year software engineering course.	Agreed
5. Consider adding a new lab with Windows or Apple computers.	The Department should strike a committee to study the benefits and costs associated with a new lab.
6. Develop a succession plan for the Computer Science teaching and research lab support positions.	Agreed. The plan should also include a strategy for training incoming graduate students as Teaching Assistants.
7. Grow the graduate program carefully, as financial resources permit.	Agreed.
8. Increase the range of graduate course offerings when teaching resources permit.	The Department should complete a curriculum review, which should include considering if there are creative ways to increase graduate course offerings.
9. Consider developing a Teaching Assistant mentoring program to help incoming graduate students with this role.	Agreed.
10. Reduce the GLER requirements in the undergraduate programs so students can add more math, computer science, or science electives.	Changes in GLER requirements will need CCC and GFC approval.
11. Increase the range of fourth-year course offerings when teaching resources permit.	This should be part of the Departmental curriculum review.
12. Give the Department an annual discretionary budget for minor operational purchases and an annual budget for computer purchases.	The Department currently has a supply budget and an allocation for computer purchases from the Faculty Life-Cycle fund.

Recommendations:	Dean's Response:
13. Develop a space plan for the relocation of the Department in 2020.	In 2013-14, a functional planning exercise was done for all programs and departments remaining in University Hall. This will be the basis of planning for the redevelopment of University Hall when the Destination Project is complete.
14. Before the relocation in 2020, investigate the creation of a separate Department of Computer Science.	The Department of Mathematics and Computer Science will have to have this discussion.

The Academic Quality Assurance Committee is satisfied that the Computer Science academic quality assurance review has followed the U of L's academic quality assurance process appropriately, and acknowledges the successful completion of the review.

Sincerely,

Alan Siaroff

Alan Siaroff

Chair, Academic Quality Assurance Committee

Cc: Andrew Hakin, Provost and Vice President (Academic)