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**MEMORANDUM**

|                  |                                                                                      |              |                  |
|------------------|--------------------------------------------------------------------------------------|--------------|------------------|
| <b>ATTENTION</b> | Senate                                                                               | <b>DATE</b>  | October 28, 2020 |
| <b>FROM</b>      | Jon Driver, Vice-President, Academic and<br>Provost <i>pro tem</i> , and Chair, SCUP | <b>PAGES</b> | 1 of 1           |
| <b>RE:</b>       | External Review of the Department of Statistics and Actuarial Science (SCUP 20-46)   |              |                  |

At its October 21<sup>st</sup>, 2020 meeting, SCUP reviewed and approved the Action Plan for the Department of Statistics and Actuarial Science that resulted from its External Review.

The Educational Goals Assessment Plan was reviewed and is attached for the information of Senate.

**Motion**

That Senate approve the Action Plan for the Department of Statistics and Actuarial Science that resulted from its external review.

C: T. Swartz, P. Kench, and G. Nicholls

MEMORANDUM

Attention: Jon Driver, Chair, SCUP

From: Wade Parkhouse, Vice-Provost and Associate Vice-President, Academic



Re: Faculty of Science: External Review of the Department of Statistics and Actuarial Science

Date: September 21, 2020

Attached are the External Review Report and the Action Plan for the Department of Statistics and Actuarial Science. The Educational Goals Assessment Plan is included, for information only, with the Action Plan.

Excerpt from the External Review Report:

*"The Department of Statistics and Actuarial Science is a very strong unit, with excellent faculty and staff, impressive student recruitment, some strong programs, and with an extremely strong record of research achievement."*

Following the site visit, the Report of the External Review Committee\* for the Department of Statistics and Actuarial Science was submitted in April 2020. The Reviewers made a number of recommendations based on the Terms of Reference that were provided to them. Subsequently, a meeting was held with the Dean of the Faculty of Science, the Chair of the Department of Statistics and Actuarial Science, and the Director of Academic Planning and Quality Assurance (VPA) to consider the recommendations. An Action Plan was prepared taking into consideration the discussion at the meeting and the External Review Report. The Action Plan has been endorsed by the Department and the Dean.

**Motion:**

**That SCUP approve and recommend to Senate the Action Plan for the Department of Statistics and Actuarial Science that resulted from its external review.**

\*External Review Committee:

Mary Hardy, University of Waterloo (Chair of External Review Committee)  
Thierry Duchesne, Université Laval  
Wendy Lou, University of Toronto  
Angela Brooks-Wilson (internal), Simon Fraser University

Attachments:

1. External Review Report (April 2020)
2. Department of Statistics and Actuarial Science Action Plan
3. Department of Statistics and Actuarial Science Educational Goals Assessment Plan

cc Paul Kench, Dean, Faculty of Science  
Tim Swartz, Chair, Department of Statistics and Actuarial Science

# Department of Statistics and Actuarial Science Simon Fraser University 2020 Unit Review

## **Review Committee**

Thierry Duchesne, Département de Mathématiques et Statistique, Université Laval

Mary Hardy, Department of Statistics and Actuarial Science, University of Waterloo (Chair)

Wendy Lou, Dalla Lana School of Public Health, University of Toronto

Angela Brooks-Wilson, Department of Biomedical Physiology and Kinesiology, Simon Fraser University (Internal)

**Date of the site visit:** March 11-13, 2020

## **Summary and Key Recommendations**

The Department of Statistics and Actuarial Science is a very strong unit, with excellent faculty and staff, impressive student recruitment, some strong programs, and with an extremely strong record of research achievement.

In the past decade, the research standing of the Statistics group has increased dramatically, being rated within the top five units in Canada, and with significant international profile. The successful bid to host CANSSI, beating out bids from several high profile institutions, should be seen as a strong signal that the quality of the group is well recognized. The success has also contributed to the very successful hiring process, with several top quality researchers recruited despite competing offers from major US universities.

The Department has also been successful in attracting highly qualified undergraduate and graduate students, particularly to the statistics programs.

In this report, the committee makes a large number of recommendations. These should be considered in the context of a high-achieving department. Our recommendations are intended to facilitate the continuing success of the group in the research domain, and to enhance the performance of the Department in the teaching and learning domain. We consider that the morale of Department members is an important consideration that requires some attention. We also make suggestions as to potential initiatives to create niche programs within (more or

less) existing resources, to better integrate research and teaching, and to provide innovative and exciting opportunities for the Department's enthusiastic and talented students.

There are a total of 34 recommendations in this report. For convenience, all are listed in Appendix 1. In this summary, we present those that we consider most important. There are three main themes.

## **1. Departmental Morale, Physical Space, Workloads**

These items are interrelated. There is an urgent problem of morale in the Department, particularly amongst more senior faculty. This is exacerbated by the perception that the University senior management does not recognize the crisis of physical space, for faculty, for graduate students, and with respect to shared spaces. The following recommendations relate predominantly to this issue.

### **Recommendation 1:**

The University should work with the Statistics and Actuarial Science Department and the Faculty of Science to find short and long term solutions to the crisis of faculty office space.

### **Recommendation 2:**

The Department should prioritize PhD students in allocating graduate student desk space.

### **Recommendation 30:**

The Department should recruit 1.5 additional staff; it should separate the roles of Graduate Secretary and Chair's Secretary, and should separate the roles of Undergraduate Secretary and Finance Officer.

### **Recommendation 32:**

The Faculty of Science should allocate room K9509 for the use of the Statistics and Actuarial Science Department (currently shared space with Mathematics), to communicate that the Department's voice has been heard, and that their needs are important.

## **2. Teaching and Learning**

Relationships between faculty and students appear to be very positive for senior undergraduates and for graduate students. The emphasis on applied statistics and data analytics allows undergraduate students at SFU to receive some of the best applied and computational statistical training in the country. However, teaching quality is an area where there is room for improvement. The committee has significant concerns with respect to students' learning experiences, especially for lower level undergraduates and for students enrolled in service courses. A related issue is that the Department offers very many more courses than they have resources to teach, using continuing faculty.

It is quite urgent, in our view, that the Department makes some significant changes to ensure that teaching at all levels is at least adequate in the short term, and that improving the

quality of teaching and learning is a priority in the long term. The following recommendations relate to this topic.

**Recommendation 4:**

The Department should recruit three high quality continuing lecturers in statistics, qualified and competent to teach large enrolment service and lower division statistics major classes.

**Recommendation 5:**

The Department should substantially and urgently reduce its reliance on sessional and limited term instructors for teaching lower level classes.

**Recommendation 6:**

The Department should reduce the number of course offerings, by cutting or combining some service courses, and by holding some joint 400/800 courses.

**Recommendation 7:**

The Department should set aside 2-3 upper division courses per year to be assigned for teaching by senior graduate students.

**Recommendation 9:**

The Department should create learning outcomes and objectives for each program, with mappings to individual courses. The role of each course in meeting the overall learning objectives should be identified and communicated to the students.

**Recommendation 14:**

The Department should take steps to achieve higher response rates in course evaluation surveys, and should encourage instructors to read the submissions and use the feedback to improve their teaching where appropriate.

**Recommendation 15:**

The Department should encourage all faculty to register for relevant courses and workshops in CEE. This should be emphasized for junior faculty, for faculty teaching very large groups, and for any instructors receiving consistently poor course evaluations. Recognition of CEE participation should be part of the annual faculty review process.

**Recommendation 34:**

The AVP-Teaching and Learning should be involved in unit reviews.

### **3. Opportunities**

The Department has gathered a remarkable collective talent in a number of popular niche areas. This gives rise to some exciting potential opportunities. The following recommendations offer some suggestions for creating new options, programs and opportunities that we believe will be very popular, and that are consistent with the University's strategic plan.

**Recommendation 22:**

The University, in collaboration with the Department, should consider establishing an Institute for Sports Analytics.

**Recommendation 23:**

When resources permit, the Department should explore the potential for a professional masters program in sports analytics.

**Recommendation 24:**

When resources permit, the Department should introduce 300 and/or 400/800 courses in sports data analytics.

**Recommendation 25:**

The Department should introduce data science options within the Statistics and Actuarial Science BSc programs.

**Recommendation 26:**

The Department should explore the possibility of creating a 4+1 taught BSc/MSc program in Statistics with Data Science.

**Recommendation 27:**

The Department should postpone development of professional masters program in actuarial science until the MSc - Actuarial Science program is modernised, and until there is sufficient interest from within the actuarial science group. If the initiative is revived, consider a niche program incorporating a data science specialisation.

# 1 Introduction

The review committee assessed the Department of Statistics and Actuarial Science, following the process outlined in the *Senate Guidelines for External Review of Academic Units*.

Before the site visit, the review committee were provided with a number of documents, including the Senate Guidelines, the Department's Self Study Document, the university's *Institutional Accountability Plan and Report*, the Faculty of Science Academic Plan, faculty CVs, and the Terms of Reference for the review.

Over the course of the three-day site visit, the committee met with faculty, staff and students from the Department of Statistics and Actuarial Science, as well as with senior administrators. A list of meetings and participants is given in the Appendix.

The committee toured the facilities of the Department, including graduate student space, the Statistics Workshop (tutorial drop-in centre), the CANSSI facility, and the faculty common room, which is shared with the Mathematics Department.

The committee requested information that was not provided in the Self-Study Document, most notably example course evaluation summaries and course enrolment numbers. These were provided by the Department. We also asked for information on learning outcomes, with mappings to courses, but these were not available. Although the Self-Study Document included a statement on educational goals, it was extremely brief, and offered no measurable criteria for assessing whether the goals are being met. Other information such as program degree requirements, were downloaded from the SFU website.

In the following report, we summarize our assessment of the Department, broadly following the headings used in the Terms of Reference. For each category, we outline the strengths of the Department, as well as any relevant challenges and opportunities.

## 2 Quality of Faculty Research

### 2.1 Strengths

The quality of the statistics research produced by the Department is very impressive. Within the past 10 years, the Department has developed a strong international reputation, and has risen to rank in the top five statistics groups in Canada<sup>1</sup>, with potential to move even higher. In particular we note the following.

1. All professorial ranked faculty in statistics, and three of five professorial ranked faculty in actuarial science have current NSERC grants.
2. Four people have received NSERC Accelerator Supplements in the past 10 years. This is one more than was awarded to the 16 regular UBC statistics researchers in a similar period (up to 2018/9).

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<sup>1</sup>Toronto, Waterloo, UBC, McGill, SFU

3. The NSERC Discovery Grants of all younger faculty, and of almost all research active faculty, increased significantly at their latest renewal.
4. Members of the Department have earned numerous awards and honours recognising their contribution to the discipline, including seven Fellowships of the American Statistical Association, one Fellowship of the Royal Society of Canada, a Statistical Society of Canada Gold Medal, and two current CRC Chairs.
5. The reputation of the statistics group was a significant factor in the university's successful bid to host CANSSI. Bringing this national research centre to the West Coast is a notable achievement, given the interest and bids from other universities in Central and Eastern Canada.
6. The research output of the Department is substantial and influential. Almost every faculty member lists publications in one or more of the best journals in statistics or machine learning, including *Annals of Statistics*, *Journal of the American Statistical Association*, *Biometrics*, *Technometrics*, *NIPS*, *SIAM* journals, *Bioinformatics*, and *Biometrika*.
7. Talented early career researchers, and very strong doctoral students, are attracted to the Department based on the very high research reputation of its faculty.
8. The faculty CVs indicate numerous productive collaborations within the Department and across the university, as well as major involvement in the statistical and actuarial communities through duties on leading journal editorial boards, presence on boards and executives of professional societies, and chairing peer-review committees for funding agencies.

## 2.2 Challenges

The research of the Department is going from strength to strength; the rise to the top tier of statistics groups in Canada has earned the admiration of the statistics community. With the right support, the Department could move even higher; however, if the emerging problems of space and workload are not urgently addressed, it will be difficult for the Department to continue to build on their success.

### 2.2.1 Office space

The crisis of physical space was fervently communicated to the committee by virtually everyone that we spoke to from the Department. There are insufficient offices to house the faculty together. Three new faculty have been hired, but only one office will be available within the Department; that means that two new research faculty, both of whom are said to have turned down offers from top US universities, will be allocated offices somewhere away from their colleagues, possibly far from the Department resources and from their graduate students. This is extremely unfortunate for a department that values collegiality and collaboration. (It is possible that current faculty members will be asked to move instead, which



would potentially create even more problems of disaffection). Faculty on sabbatical have, at some times, not been given access to their own offices. Faculty hired in the past two to three years found themselves in temporary office accommodation for several months at the start of their contracts. One had to clear the belongings of the previous inhabitant himself before he could move into his office. Each of the junior faculty warned that the office space situation could create retention issues in the future, and contributed to at least one exit in the recent past.

We note that a new system of space allocation is under development across the university. We hope that the Department will receive a more adequate allocation of office and seminar room space under the revised system, without the need for aggressive negotiation. In the meantime, we strongly urge the university to explore some creative short term solutions to the problem – for example, negotiating a ‘loan’ of what appears to be underused space close to the Statistics and Actuarial Science Department, which currently belongs to the Faculty of Applied Science.

**Recommendation 1: The University should work with the Statistics and Actuarial Science Department and the Faculty of Science to find short and long term solutions to the crisis of faculty office space.**

### **2.2.2 Faculty workload**

The pressures of workload on statistics faculty at all levels have increased, partly as a result of the fast pace of growth of enrolments. While each research active faculty member teaches a standard three courses, (except those involved in distance ed, who teach many more) the demands of these courses have increased significantly. This is discussed further in Section 3.4.1 below. In addition, the staff support for the work of the faculty has been significantly disrupted, with the result that some work that should be delegated to the staff must be covered by the faculty.

### **2.2.3 Graduate student space**

The Department has been very successful in recruiting high quality graduate students, many of whom have contributed significantly to the Department’s successful research record. However, there is insufficient space available for the use of graduate students. Around 30 desks are available for over 70 students. All students are expected to hot-desk, which creates tensions. Students assigned to hot desks in the Big Data Hub have been made to feel unwelcome, as the space allocated to them has been systematically reassigned.

Currently, the Department appears to assign students to the two hot-desk areas randomly. A better use of resources might be to guarantee space to the full time PhD students (unless they are beyond time limits), and assign the remaining desks for Masters students under a hot-desking system. Unfortunately, under this system, there would be very few desks, if any, available for Masters students under the current resources.

**Recommendation 2: The Department should prioritize PhD students in allocating hot-desk spaces.**

**Recommendation 3: The Dean of Science should work with the Department to allocate suitable and sufficient hot-desk space for Masters students.**

#### **2.2.4 Departmental Staff Support**

Departmental staff support has been disrupted over the past 1-2 years, with a high turnover of staff apparently resulting, at least partially, from excessive workloads. Recent tensions and conflicts described (in vague terms) by the staff appear to have been substantially (though not completely) resolved, but the problem of staff burn-out remains. In our opinion, having a staff group that is committed, engaged and efficient contributes very significantly to the overall success of an academic unit, by allowing faculty to focus on their own work, rather than on paperwork, and by creating a resource for the Chair, Associate Chairs and Department committees.

There will be further staff turnover, with knock-on effects on research, teaching and morale, if the problem of the staff workload is not resolved. We discuss this issue in more detail in Section 4.

### **3 Quality of the Department's programs**

#### **3.1 BSc programs**

The Department offers undergraduate programs in Statistics, Actuarial Science, and Data Science (collaborative). Enrolment in the statistics major program grew by over 100% in the past 10 years, although there has been a decline in the number of Actuarial Science majors. In aggregate, however, a fast pace of growth has led to some pressures on the faculty and students.

The Department offers a large volume of service teaching, largely at 100 and 200 level for undergraduate students, but also at 600 level for graduate students from outside the Department.

The structure of the three majors and the statistics minor are appropriate. The list of courses offered is reasonable and the emphasis on applied statistics and data analytics allows undergraduate students at SFU to receive some of the best applied and computational statistical training in the country.

Almost all of the actuarial science undergraduates, and around 1/2 of the statistics undergraduates participate in an excellent cooperative education program.

In addition, the unit is able to retain around eight strong USRA research students every summer, a very healthy enrolment in the statistics and actuarial science areas, especially given the competing and lucrative attractions of the co-op placements.

## 3.2 MSc and PhD programs

The Department offers two-year MSc programs in Statistics and Actuarial Science, and a PhD in Statistics.

## 3.3 Strengths

- The undergraduate and graduate students were very complimentary about most aspects of their SFU experience, mentioning in particular the approachability of faculty, the quality of teaching in upper level courses, and the service received from the cooperative education unit.
- The Statistics Workshop – a drop-in tutorial centre for lower division students – offers a valuable resource, with over 30 hours a week of TA availability in an attractively refurbished space.
- Although we did not have data on entry quality for the graduate and undergraduate students, we found them very impressive and insightful; the Department should take pride in its ability to attract and retain high quality, interesting and diverse students.
- The undergraduate students benefit from a highly successful co-op program. The co-op coordinators have established strong relationships with top employers.
- The range of courses on big data topics in the undergraduate program was an attractor for several students. Other students came to SFU intending to study actuarial science, but discovered a preference for statistics once they had taken a few courses.
- The separate identity of the Department (compared with statistics programs within mathematics departments) was seen as a distinct advantage, particularly by graduate students.
- All the graduate students that we spoke with stated that they had no regrets about their choice of university and program, and would make the same choice again.
- The recent hiring of a Property and Casualty Insurance specialist in the Actuarial Science group will significantly enhance and expand the interests of the group, and will potentially lead to enhanced coverage of applied topics for both undergraduate and graduate students.

## 3.4 Challenges

### 3.4.1 Teaching resource and quality

The Department is offering significantly more courses than it has resources to teach using continuing faculty, with around 81 courses offered per year, compared with a capacity of around 50 courses, based on continuing faculty resources. With an additional three hires

currently in process, and another 1/2-hire projected for next year, the ultimate capacity will be around 60 courses, which leaves a gap of 20, assuming no retirements or resignations. The gap will be larger in the short term as the new faculty work through a period of reduced course loads.

In order to square this circle, the Department has resorted to assigning many of the large introductory courses and service courses to non-regular faculty (sessional instructors, limited term lecturers).

There are significant deficiencies in the quality of teaching in most of the lower division courses taught by non-regular instructors. Course evaluations from these classes comment on, for example, disrespectful and dysfunctional classroom environments, name calling of students by instructors, persistent lateness (by 20-40 minutes) of instructors, excessive classroom noise, lack of consistency or cohesion in the materials, missing course outlines, numerous uncorrected errors in notes and assignments, and failure to coordinate with TAs. Many students took the time to write long, articulate explanations of how the course, the instructor, and the Department failed them. It is apparent that some past instructors are either insufficiently competent with respect to the course content, or insufficiently skilled in teaching, or both. Nevertheless, these instructors were assigned to the same courses, with the same outcomes, in multiple successive semesters.

We are relieved to note that, for a change, the Department has allocated the introductory service statistics course (STAT100) and the first statistics major course (STAT270) to continuing faculty for the next two semesters. This is good news for the students and for the reputation of the Department. However, given the mismatch between the number of courses offered and the number of continuing instructors available, the problem of poor teaching by non-continuing faculty will remain unless other changes are made.

To address this, we strongly recommend that the Department should apply for three new continuing lecturer positions in statistics. This would add (ultimately) 18 courses of instructor resource. Assuming successful hiring of high quality teachers of statistics, the new continuing lecturers would relieve some of the burden of the Chair and Associate Chair, who waste substantial time trying to allocate too many courses to too few instructors, and who currently have to deal with the file of complaint letters each semester. It should enhance the reputation of statistics service teaching across the university. Continuing lecturers can also be a very valuable resource for Departmental service, with potential to contribute to undergraduate program development, course reviews, and Departmental teaching and learning initiatives. In conjunction with the other suggestions below, recruiting high quality lecturers to teach (inter alia) the lower division courses should open opportunities for more specialist topics courses in the upper division, allowing the faculty to better integrate their teaching and research.

We anticipate some objection to the use of lecturers, on the grounds that hiring should focus on developing research. We view this as myopic. A strong continuing lecturer base facilitates a Department's research, by creating more time for the researchers to do their own work.

**Recommendation 4: The Department should recruit three high quality continuing lecturers in statistics, qualified to teach large enrolment service and lower division statistics major classes.**

**Recommendation 5: The Department should substantially and urgently reduce its reliance on sessional and limited term instructors for teaching lower level classes.**

### **3.4.2 Course offerings**

Whether or not the Department acquires the suggested lecturer positions, we suggest that it would be far better to teach fewer courses adequately, than more courses inadequately. Matching courses to resources requires some hard choices, but if the resources are not available, compromises must be made, and the current approach, which puts the burden on students enrolled in the lower division and service courses, is the wrong compromise. We believe that there are opportunities for trimming the number of courses offered. We make the following suggestions as examples of the decisions that could be made.

1. The service courses STAT 205, STAT 310, STAT 311 and STAT 320 could be dropped or combined with other existing courses.
2. Some 400 and 800 courses could be held together – for example, STAT 450 and 830; STAT 403 and 841; STAT 445 and 852. We note that the 400 courses are 3 units, and the 800 courses are 4 units. This gives additional time for the 800 courses to cover advanced or enhanced content.
3. The actuarial science graduate courses are currently being revised. Consider some jointly held 400/800 courses in the revision; for example, with ACMA 440 and ACMA 455.

**Recommendation 6: The Department should reduce the number of course offerings, by cutting or combining some service courses, and by holding some joint 400/800 courses.**

### **3.4.3 Teaching by PhD students**

The Department is fortunate to have a number of very strong, very motivated PhD students. The current approach is not to assign any teaching to them. This not only wastes a potentially valuable teaching resource, it may disadvantage the students when they apply for academic positions. We consider that 2-3 courses per year could be taught by senior graduate students (but with no more than one per year to any individual student). However, the assigned teaching should not include the very large lower division classes – these should be taught by experienced instructors.

**Recommendation 7: The Department should set aside 2-3 upper division courses per year to be assigned for teaching by senior graduate students.**

### 3.4.4 Statistics Workshop

The self-study document noted that the Statistics Workshop is so successful that it can be overcrowded, and the requirement for TAs to keep abreast of content and assignments for seven disparate courses (several of which are taught by off campus sessional instructors) has created problems. The Department proposes splitting the workshop into two sections, one for the more basic courses, and one for the more advanced (but still lower division). Currently, it appears that the annual course load credit for supervising the workshop is five courses (based on the assumption that a standard load for a continuing lecturer is six courses), which is generous compared with similar drop-in centres in other universities. Also, the workshop space appears adequate.

We consider that it should be possible to split the workshop into two streams within the current resource. For example, the two streams could be assigned to different time slots, or at certain times, one part of the room could be allocated to the service courses, and the other to the major courses. We consider that the split should be achievable within the resource currently allocated to the Workshop. We note that some of the coordination problems would be alleviated if the instructors involved are all continuing faculty.

**Recommendation 8: The Department should split the Statistics Workshop into two streams within current space/instructor resource.**

### 3.4.5 Educational Goals / Learning Outcomes

We note that the Department has not embraced the use of educational goals in program and curriculum development. The educational goals cited in the Self-Study Document are vague, minimal, and do not adequately distinguish between service courses, undergraduate programs and the different graduate programs. In fact, the educational goals of the Statistics Majors, Honours, MSc and PhD programs are identical, which is clearly inappropriate. The additional goal related to Actuarial Science states that the objective is preparation for the Society of Actuaries exams – not a particularly ambitious goal, especially since many students take these exams without a degree in actuarial science. In fact several undergraduate students that we spoke with planned to study actuarial science when they chose SFU, but decided not to because the value added (compared with just passing exams) was not clear to them.

To check whether learning outcomes existed but were not included in the Self-Study Document, we reviewed a sample of individual course outlines (downloaded from the web), and found them generally silent on the relevant learning outcomes.

We believe it can be particularly helpful in determining which courses to offer, and how to offer them, to set down the learning objectives and learning outcomes at the program and course level. The mapping of learning outcomes to courses can identify redundancies or gaps in the curricula, and is valuable to students in understanding what each course is designed to achieve, and how the courses fit together. At the individual course level, learning outcomes help create consistency from semester to semester, and ensure that pre-requisites and co-requisites are coherent.

The co-op coordinators noted that employers would like students to have more experience

with case study type projects, based on real world data and problems. This would be a good topic for inclusion in the learning objectives and course mapping.

The Centre for Educational Excellence would probably be able to help the Department through this exercise. We note that the Department was supposed to have more extensive educational goals specified in the Self-Study document, according to the Senate Guidelines, so this exercise will need to be conducted before the next review in 2027.

**Recommendation 9: The Department should create learning outcomes and objectives for each program, with mappings to individual courses. The role of each course in meeting the overall learning objectives should be identified and communicated to the students.**

**Recommendation 10: The Department should update the Actuarial Science educational goals to include more relevant and attractive objectives than simply passing exams.**

### **3.4.6 Actuarial Science - undergraduate enrolment**

The number of students selecting the actuarial science major has declined in recent years; if the trend continues, the viability of the program may be at risk.

We note that, of the six undergraduate students that we spoke with, four came to SFU intending to do actuarial science, but ended up in the statistics major instead. Given that they all appear to be strong and interesting students, it seems that the act sci program brings benefits that are not reflected in their own enrolments. However, it is not ideal if the actuarial science program consistently fails to meet the expectations of its students.

The act sci undergraduate program has a very strong reputation in the industry, developed through the 2000's and early 2010's. At that time the program had the luxury of imposing very demanding entry standards, whilst maintaining their target enrolment. This is no longer the case; the entry standards are still very high, and the graduates extremely well regarded (the success of co-op placements is testimony to this), but the decline in enrolment requires some changes in approach.

The actuarial science faculty claimed that the rise in data science has created a reduction in demand for actuarial science. There is some truth in this, but there are things that can be done to reverse the trend. The group has taken the initiative to introduce a 100-level introductory course. The second course (ACMA 210) has been treated as a 'gatekeeper' course, designed to be more challenging than strictly necessary for the course content, with the objective of weeding out all but the best and most motivated students. The group should reconsider this approach, given the decline in numbers. It may be that, instead of producing undergraduates who are in, say, the top 10% of entry level actuarial candidates on graduation, it would be acceptable to produce graduates in the top 20%. Relaxing, slightly, the standards in ACMA 210, and potentially in the subsequent courses, would still create very well-qualified, hire-able graduates. However, the group should also consider and communicate how the program creates value beyond passing SOA exams, as this message is apparently not being communicated to potential lower division students.

**Recommendation 11: The Department should reconsider the design and role of ACMA 210.**

### 3.4.7 Actuarial Science - graduate enrolment

The Actuarial Science MSc enrolment has also declined to near non-viable numbers. The structure of the program in the current calendar is extremely outdated. The Actuarial Science group brought some new courses to their meeting with the review team, which they intend to teach as topics courses until the calendar can be revised.

The main failing of the current calendar is the absence of financial mathematics or quantitative risk management. The revised courses presented address this with a course in ‘Stochastic Processes in Insurance and Finance’, and another in ‘Actuarial Risk Management’. We support the general direction, but also encourage the group to aim for at least some courses to be jointly held with 400-level courses, and also to ensure that the course content balances theory with real world application. Not all MSc students continue to PhDs, and even those who do should be aware of the real world context of the discipline. We note that life insurance, and pension design and risk management are not covered, even though these are major research areas of the group.

Even with the updated curriculum, the MSc program may not substantively increase enrolment. However, leveraging the Departmental expertise in data science (a topic of huge current interest in the financial services industry) could make a more significant difference. Currently, the list of STAT 800 courses that may be used to meet the requirements in the Actuarial Science MSc is unnecessarily narrow. We suggest expanding the list, and creating a data science option, similar to that proposed for the undergraduate program. This would much better differentiate the program from its competitors.

**Recommendation 12: The Department should expedite an appropriate update to the Actuarial Science MSc curriculum, and should consider adding a Data Science option.**

### 3.4.8 Teaching and learning

While the undergraduate students that we spoke with (all stats majors) were very complimentary about their instructors, overall the review committee found the Department’s attitude to teaching and learning ambivalent. For example:

- As noted above, in several lower division courses the same instructors were assigned to the same courses multiple times, despite the strong evidence, semester after semester, of very poor learning outcomes for students.
- Most of the instructors that we spoke with did not give much credibility to course evaluations, ostensibly because of low response rates. It is true that, of the samples that we saw, the response rate was only around 30%. However, many of those who did respond were clearly assiduous students, who took the time to provide detailed feedback



and concrete suggestions. We also note that it is possible to increase response rates, for example, by allocating class time to the survey, and also by making it clear that responses will be read and taken seriously.

- The lack of rigorous educational goals, and the lack of information on whether the goals are achieved, signals a disconnect between the Department's view of its mission (with respect to teaching and learning), and the message from the University, as expressed in the Senate Guidelines and in the Institutional Accountability Plan and Report (IAPR). In particular, the self-study report gave no information on teaching quality, course enrolments, or students' and alumni views on the Department's courses and programs.

Now, we acknowledge that the self-study report was prepared at a time when the staff support was severely diminished. Nevertheless, it is telling that the weakest area of the report, by far, relates to teaching and learning.

- In our discussion with junior faculty, it was clear that developing teaching skills is not systematically addressed within the Department or the University. There is no formal mentoring scheme, though informal mentoring does take place. There was no connection with the Centre for Education Excellence (CEE), nor was there any encouragement for junior faculty to use the CEE's resources to improve their teaching. The message was, slightly paraphrased, that *'if my teaching is adequate, then any engagement with CEE is wasting valuable research time'*. This approach concerns us, for the following reasons.
  - Teaching is not a skill-free activity, particularly the large group teaching that virtually all of the statistics faculty are now required to undertake.
  - We do not believe that adequacy (whatever that means) is a sufficient goal for teaching quality.
  - The informal mentoring scheme puts extra unrecognised weight on the willing mentor(s), and requires junior faculty to take the initiative with respect to asking for help.
  - New developments in teaching, such as identifying learning outcomes and assessing whether they are met, are not valued or implemented.

We suggest that one faculty member should be assigned as liaison to the CEE, as part of their administrative duties. They could ensure that the Department members are kept informed of relevant CEE activities, and could also ensure that the CEE is made aware of the needs of the Department with respect to developing teaching skills and methods.

**Recommendation 13: The Department should implement a mentoring scheme for junior faculty.**

**Recommendation 14: The Department should take steps to achieve higher response rates in course evaluation surveys, and should encourage instructors to**

read the submissions and use the feedback to improve their teaching where appropriate.

**Recommendation 15:** The Department should encourage all faculty to register for relevant courses and workshops in CEE. This should be emphasized for junior faculty, for faculty teaching very large groups, and for any instructors receiving consistently poor course evaluations. Recognition of CEE participation should be part of the annual faculty review process.

#### 3.4.9 Cooperative education

The Co-op Department does an excellent job of placing students, but their work is hampered by a lack of flexibility in course offerings, in particular, the lack of upper division courses in the summer semester. This issue was also raised by the undergraduates. If the teaching resource is increased, it would be beneficial to provide a better range of summer courses.

The Co-op Department also emphasised the need for early integration of oral and written communication skills in the actuarial science and statistics curricula.

One testament to the strong computational and applied statistics skills of students trained at SFU is that, unlike other program reviews that we have seen, there were no major complaints by employers as to a lack of programming skills with the trainees.

**Recommendation 16:** When teaching resources permit, the Department should introduce a range of upper division course offerings in the summer semester.

#### 3.4.10 Teaching credit for distance education courses

Currently four lower division courses are offered as distance education courses, with each being offered every semester, for a total of 12 sections. All the distance education teaching is assigned to one individual – who is also the Department Chair. This is possible only because the distance education courses are assigned as 1/12 of the workload of on-campus courses, so those 12 courses only count for a single teaching credit. This is not sustainable. The usual credit in our institutions would be one to one or, at most, two to one, for distance education and on-campus courses.

**Recommendation 17:** Each distance education course should count for the same teaching credit as an on-campus course. Distance ed instructors should be given sufficient time to update and refresh content, and to ensure that the students' learning experience is no less rich than those following on-campus versions.

#### 3.4.11 Curriculum/program committees

Neither the self-study document nor the site visit allowed the review committee to have a clear picture of the functioning of program/curriculum committees or of the means used to guarantee program updating and quality control. Changes to programs seem to arise from individual initiatives that must then receive strong support during Departmental meetings.

Not only does this mean that program modifications are proposed by groups that may not have a programmatic view (i.e., see the “big picture”), but Departmental votes on specialized issues with which everyone is not familiar seem likely to unduly slow down progress, given the natural inclination to maintain the status quo.

Active program committees, meeting regularly, could invigorate programs by ensuring courses and program structures are regularly reviewed and updated. The appropriate Associate Chairs would lead the committees. Committee members should include the Undergraduate Advisor (for undergraduate programs), a selection of faculty/instructors who regularly teach on the program, and possibly senior students. This would ensure that the committee input is direct and relevant.

**Recommendation 18: The Department should establish active Program Committees; each program should be regularly revised and updated.**

### 3.4.12 Computational resources

The self-study document reports that access to equipment and technical support for desktop computing and super computing (i.e., jobs on Compute Canada) is excellent. However with the strengths and interests of the people in this Department in computational statistics, there is a growing need for computational tools that fall between these two extremes. In particular, some instructors of advanced undergraduate classes would like to have access to a subcluster for their teaching needs. Some research groups have also expressed the need for subclusters larger than what is currently available to the Department’s researchers, that could handle in a more flexible way the jobs that do not require the full power of Compute Canada resources.

**Recommendation 19: The Department should assign a faculty member to act as “VP Research liaison”, to ensure that researchers are aware of locally available computer resources, with priority for SFU researchers, and to ensure that the computational needs of the Department are communicated to the VP Research.**

**Recommendation 20: The VP-Research should make some of the research computing resources available for teaching purposes, for providing realistic, hands-on big data experience.**

**Recommendation 21: The Department should investigate the opportunity of assigning a team to apply for an NSERC Research Tools and Instruments Grant, with a view to acquiring a small cluster of computers dedicated to their needs.**

## 3.5 Opportunities

The pressures on the faculty created by the problems of space, lack of staff support, heavy teaching requirements (by number of students, though not by courses) arising from the growth in student numbers, and the fact that the Department is emerging from a period of low morale, have all made it difficult to find individuals to champion new opportunities – with the very notable exception of the successful bid to host CANSSI, which was a remarkable

coup.

If the university is able and willing to relieve some of the external pressures (which, at a minimum, would require finding more space for the Department, hiring more staff, and hiring some continuing lecturers), then there are potential opportunities for interdisciplinary collaboration and for professional programs.

We encountered different views on professional programs from the individual members of the Department. Some felt that they are antithetical to the mission of the university, being focussed on profit rather than research. We disagree. A good professional program creates highly qualified personnel, who are well prepared to enter the workforce and contribute to the economy. It can also generate a (potentially rich) source of funds that can be used to support the Department's research. In order for a professional program to succeed, however, there generally needs to be an individual willing to champion the initiative, together with upfront investment supporting the development of tailor-made courses, and funding the creation of a suitable physical space for the program.

### **3.5.1 Sports Analytics**

The most interesting potential opportunities relate to sports analytics. The Department is internationally recognized, with substantial expertise and influential, and with well-placed alumni connections in this emerging area. We see potential for increased knowledge mobilisation, research impact and community engagement. The Department has already initiated an informal cross-disciplinary group, with participants from Biomedical Physiology and Kinesiology, Business, Mathematics, and Computer Science. The research overlaps with the big data initiatives. SFU seems uniquely placed to create a cross-faculty Institute for Sports Analytics, which could potentially partner with local sports teams.

We also see potential for a professional, full-fee Masters program; either run as a part-time downtown program, attracting individuals currently working in the business, or as a full time, intense program for strong graduates from suitable undergraduate programs, who are interested in building a career in the field. Given the strong alumni base, a co-op component might be possible. Online course delivery should also be explored, given strong international interest, and a dearth of good programs, globally.

As a test of potential interest, and as a way to bring research into the classroom, we suggest that one or two sports analytics courses should be introduced to the undergraduate and graduate curricula (as resources permit). A formal sports analytics option within the BSc would be a very strong niche attractor for the program.

**Recommendation 22:** The University, in collaboration with the Department, should consider establishing an Institute for Sports Analytics.

**Recommendation 23:** When resources permit, the Department should explore the potential for a professional masters program in sports analytics.

**Recommendation 24:** When resources permit, the Department should introduce 300 and/or 400/800 courses in sports data analytics.

### 3.5.2 Data Science

There was no interest from the faculty members that we spoke to in developing a professional program in data science; indeed, there was some scepticism as to whether the province would allow it. However there is potential to highlight the data science opportunities at undergraduate and graduate level by introducing formal data science options within the existing major programs.

For example, a package of, say, CMPT 129, STAT 341, STAT 350, STAT 440 and STAT 452 could qualify a student for a data science option/focus/specialisation, which would be specified on the degree transcript. This would very likely enhance enrolment, without creating any new courses, and is consistent with the Faculty of Science initiative to create distinctive, niche programs. This could be an option for the Statistics major and for the Act Sci major – it would certainly be very popular with actuarial employers. With a new P&C actuary joining the Act Sci group, this would be a good time to better integrate Data Science in the actuarial curriculum.

**Recommendation 25: The Department should introduce data science options within the Statistics and Actuarial Science BSc programs.**

We also consider that the Department is well placed to introduce a 4+1 BSc/MSc in Statistics with Data Science. This program could be created with very little additional resource. We predict that it could be very popular, as Data Science jobs largely require Master’s level credentials. It would be another niche program that the Department is very well qualified to offer.

**Recommendation 26: The Department should explore the possibility of creating a 4+1 taught BSc/MSc program in Statistics with Data Science.**

### 3.5.3 Actuarial Science

Although the possibility of a professional program in actuarial science has been mooted, there is little enthusiasm for this within the act sci group. Without this interest, it seems unlikely that such a proposal will succeed. If the level of interest does rise in the future, a program with a data science emphasis would more likely succeed than a straight-up, traditional actuarial science program.

**Recommendation 27: The Department should postpone development of professional masters program in actuarial science until the MSc - Actuarial Science program is modernised, and until there is sufficient interest from within the actuarial science group. If the initiative is revived, consider a niche program incorporating a data science specialisation.**

The recruitment of a P&C actuary to the actuarial faculty allows the group to expand its teaching of short term insurance, which is an area that is not well covered by most Act Sci undergraduate programs in Canada. The growing connection between P&C insurance and data science indicates a potential for a 4+1 BSc/Msc program in Act Sci with Data Science, similar to that suggested above for Statistics.

### 3.5.4 Other initiatives

The Self-Study document lists several other ongoing initiatives.

The cluster hiring initiative appears to be working well already, and is consistent with the university's aim to develop cross-disciplinary collaborations.

**Recommendation 28: The Department should continue exploring cluster hiring initiatives.**

Two-plus-two undergraduate partnerships with international universities have worked very well for other institutions, especially in actuarial science, and we support the development of similar agreements for the Department. If successful, there may be opportunities for extending the program to incorporate the MSc in Actuarial Science, in a 2+3 arrangement.

**Recommendation 29: The Department should continue exploring international 2+2 programs in actuarial science.**

The collaborative teaching initiative is less compelling. Whilst the idea is clearly strong, it is taking much needed resources from the major courses. There were fewer than 20 students in each of the collaborative courses, while the introductory courses for statistics major students had enrolments of 100-200 students. We suggest that the Department focus its resources on providing high quality teaching across a modern curriculum for its major and honours students, with enhanced summer course offerings, and with innovative courses such as sports analytics. Service teaching could be concentrated into a smaller number of courses, but also needs to maintain high teaching standards.

## 4 The administration of the unit

The administration of the unit has gone through some significant, and apparently quite painful changes in the past few months. In Section 2.2 we noted the intense pressure that the four administrative staff are under currently. We also heard from the faculty that there is a reluctance to ask staff for advice or support because they are aware of the excessive workloads that staff are currently managing. In addition, two of the administrative staff are on temporary contracts, and one of the two permanent staff is in a role that is relatively new to them. All the staff that we met, whether permanent or temporary, impressed the review committee with their professionalism and commitment, and were highly valued by the Chair and others.

Currently the staff roles in the Department are:

1. Department Manager
2. Grad Secretary/ Chair's Secretary
3. Undergraduate Secretary/ Receptionist/ Finance Officer.
4. Undergraduate Advisor.

We consider that the size and range of activities of the Department justify an extra 1.5 staff members. We propose the following changes.

- Separate the roles of Graduate Secretary and Secretary to the Chair. These are both substantial jobs. If the roles were separated, the graduate students would have a better resource for their logistical needs, and the Chair could delegate substantially more to the staff, freeing their own time for more strategic initiatives.
- Separate the roles of Undergraduate Secretary and Finance Officer. This would allow the individuals to focus their efforts, and would presumably widen the pool of potential candidates for the Undergraduate Secretary position, if they did not also have to be qualified to manage financial reporting. Our proposal is that the finance officer might be a 50% position, perhaps shared with another department, or perhaps as a part-time appointment.
- Expand the role of the Undergraduate Advisor. Currently, the advisor does not participate in program committees. They are also restricted in their decision making powers, for example in respect of over-riding pre-requisites. We consider that the Advisor could take on substantially more of the operational tasks associated with servicing the undergraduate students and programs, including organizing the program committee meetings, and proposing and preparing the documentation for minor program changes. This would free the undergraduate program chair to explore more strategic initiatives, or to focus on their own teaching and research.

**Recommendation 30: The Department should recruit 1.5 additional staff; it should separate the roles of Graduate Secretary and Chair's Secretary, and should separate the roles of Undergraduate Secretary and Finance Officer.**

## 5 Unit's workplace environment

The Department has, apparently, come through a period of conflict and low morale. While the conflicts seem to have abated, the low morale is still apparent in some quarters.

Part of the problem, in our opinion, stems from the fact that the Department feels undervalued by the University. There is a sense of hopelessness that the problems of physical space will be resolved satisfactorily in the short or medium term. There is also a belief that the Mathematics Department dominates the shared spaces, and may be more favourably treated by the administration. Whether or not these impressions are true is less important than the fact that the Department, and particularly its senior members, believe them, and do not feel heard by the University. This dampens enthusiasm for new initiatives, and makes the role of Department Chair extremely unattractive to all the most qualified individuals.

We are told by one senior administrator that the Department should be more 'aggressive' in its demands, but this seems to be putting too much responsibility on the Department side. The statistics group has worked very hard to increase its research and profile in the international community. It is hiring extremely well, and recruiting top class graduate

students. It should not need aggressive negotiators in order for the University to recognize the importance of providing a suitable physical space and collegial environment, for all its faculty and staff.

We have already noted the urgent need for more office space. However, we also note that the common space for faculty is very small, is shared with mathematics, and is not conducive to informal discussions. Often, having an informal discussion space can head off potential conflicts. Otherwise, the first discussion of contentious topics happens when the stakes are at their highest, i.e. in Department meetings.

**Recommendation 31: The Faculty of Science should explore the possibility of more suitable common room space for Statistics and Act Sci faculty.**

The Department manages very little space (a single small meeting room), but it shares a seminar room with the Mathematics Department (Room K9509). Access to this room is perceived to be dominated by the Mathematics Department. Given that the Stats and Act Sci Department has just ceded some valuable space to the Mathematics Department (to make room for a Canada 150 Research Chair), it would be reasonable to assign Room K9509 to the Statistics Department. This would send a strong positive signal to the group that their crisis of physical space is being treated seriously at the University and Faculty levels, and would create a much needed space for formal and informal meetings of faculty. This one action could significantly improve overall morale.

**Recommendation 32: The Faculty of Science should allocate room K9509 for the use of the Statistics and Actuarial Science Department (currently shared space with Mathematics), to communicate that the Statistics and Actuarial Science Department's voice has been heard, and that their needs are important.**

## 6 Future Plans of the Unit

Some current initiatives are discussed above. The Department has just completed a wide scale hiring process, which has been very successful, but also very demanding. The future plans are somewhat muted, possibly waiting for the new faculty to join the Department.

The chair for strategic initiatives was not very positive about the future initiatives under his remit. He was pessimistic about the proposal for a professional program in actuarial science, and also about the potential for a professional program in Data Science. He did propose a Certificate in Data Science, but the review committee was not given any indication of who this would target, and how it would be delivered. The review committee considers that initiatives that enhance the learning experience within the current programs, including the creation of options, should be prioritized.

## 7 Comments on the review process

The committee has noted two potential areas for improving the process. First, some essential information was missing from the Self-Study document, despite being a requirement



under the Senate Guidelines (Section 3.2). Most critically, we were missing any information on course evaluations, course enrolments and teaching quality. Although we subsequently requested and received a sample of course evaluations, and some course enrolment data, it would have been preferable for these to have been included in the original package.

Other information that is required in the Senate Guidelines, but was missing from the Self-Study document included: information on student satisfaction following graduation; course requirements; information on operating budget; numbers of faculty and staff; Department committees and assignments; information on orientation and training of faculty and staff; faculty involvement in community groups; number of publications and citations.

Some of the missing information was available within the faculty CVs, but these were not easily navigated, as the formats and lengths were highly variable. It would have been very helpful to have standardized CVs with recent papers/teaching/seminars/service included in full, and earlier contributions summarised as lifetime totals.

**Recommendation 33: The University should implement a checklist system for the self-study report, to ensure that reports are not distributed to reviewers until the minimum required information is included.**

Secondly, the review committee noted that the IAPR includes the statement:

*“As an initiative, educational goals and assessment have been integrated into the academic culture and structure of the university.”*

The fact that our scheduled meetings included the AVP-Research but not the AVP for Teaching and Learning gives a mixed message at the institutional level about the relative importance of teaching and learning, compared with research. Given that a substantial part of our discussions involved teaching quality, including the training of junior faculty, and the setting and assessing of educational goals, it would have been very useful for the AVP-Teaching and Learning to be involved in the discussions. It would also give a less equivocal signal of the importance of teaching and learning within the mission of the university.

**Recommendation 34: The AVP-Teaching and Learning should be involved in unit reviews.**

On a positive note, the logistics of the review process were extremely well organised by the UCIL coordinator, Ms Basi. The review committee is very grateful to her for her efficiency and consideration. We are also grateful to all the individuals with whom we spoke, including students, faculty, and staff. All were cooperative, engaged and forthcoming. Finally, we would like to thank the Department for their hospitality and consideration.

## Appendix 1: Recommendations

### **Recommendation 1:**

The University should work with the Statistics and Actuarial Science Department and the Faculty of Science to find short and long term solutions to the crisis of faculty office space.

### **Recommendation 2:**

The Department should prioritize PhD students in allocating graduate student desk space.

### **Recommendation 3:**

The Dean of Science should work with the Department to allocate suitable and sufficient hot-desk space for Masters students.

### **Recommendation 4:**

The Department should recruit three high quality continuing lecturers in statistics, qualified and competent to teach large enrolment service and lower division statistics major classes.

### **Recommendation 5:**

The Department should substantially and urgently reduce its reliance on sessional and limited term instructors for teaching lower level classes.

### **Recommendation 6:**

The Department should reduce the number of course offerings, by cutting or combining some service courses, and by holding some joint 400/800 courses.

### **Recommendation 7:**

The Department should set aside 2-3 upper division courses per year to be assigned for teaching by senior graduate students.

### **Recommendation 8:**

The Department should split the Statistics Workshop into two streams within current space/instructor resource.

### **Recommendation 9:**

The Department should create learning outcomes and objectives for each program, with mappings to individual courses. The role of each course in meeting the overall learning objectives should be identified and communicated to the students.

### **Recommendation 10:**

The Department should update the Actuarial Science educational goals to include more relevant and attractive objectives than simply passing exams.

### **Recommendation 11:**

The Department should reconsider the design and role of ACMA 210.

**Recommendation 12:**

The Department should expedite an appropriate update to the Actuarial Science MSc curriculum, and should consider adding a Data Science option.

**Recommendation 13:**

The Department should implement a mentoring scheme for junior faculty.

**Recommendation 14:**

The Department should take steps to achieve higher response rates in course evaluation surveys, and should encourage instructors to read the submissions and use the feedback to improve their teaching where appropriate.

**Recommendation 15:**

The Department should encourage all faculty to register for relevant courses and workshops in CEE. This should be emphasized for junior faculty, for faculty teaching very large groups, and for any instructors receiving consistently poor course evaluations. Recognition of CEE participation should be part of the annual faculty review process.

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Each distance education course should count for the same teaching credit as an on-campus course. Distance ed instructors should be given sufficient time to update and refresh content, and to ensure that the students' learning experience is no less rich than those following on-campus versions.

**Recommendation 18:**

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**Recommendation 23:**

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**Recommendation 34:**

The AVP-Teaching and Learning should be involved in unit reviews.

## Appendix 2: Site Visit Schedule

Wednesday March 11, 2020

|       |       |                                                                                                                                                                                                  |
|-------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8:15  | 9:00  | Opening meeting with senior administrators<br>G Nicholls, Director, Academic Planning; D O'Neil, AVP Research;<br>J Derksen, Dean GPS; Paul Kench, Dean of Science;<br>B Basi, Coordinator, UCIL |
| 9:15  | 10:30 | Dept Chair, with tour of facilities<br>Tim Swartz                                                                                                                                                |
| 10:45 | 11:30 | Associate Chairs<br>B Tang, Associate Chair, T Loughin, Chair for Strategic Initiatives                                                                                                          |
| 11:30 | 12:00 | Biostatistics group<br>L Elliott, J Graham, J Hu, B McNeney, L Wang                                                                                                                              |
| 12:00 | 1:30  | Reception with faculty, staff and invited students                                                                                                                                               |
| 1:30  | 2:15  | Departmental Staff<br>C Bradbury, Dept Manager; Carlye Vroom, Undergrad advisor<br>Jay Young, Chair/Grad Secretary; J Nan, undergrad/finance secretary                                           |
| 2:15  | 2:45  | Act Sci group<br>JF Bégin, I Lu, G Parker, C Tsai                                                                                                                                                |
| 3:00  | 3:30  | Co-op Coordinators<br>N Erikson, G Litchfield, S Billings                                                                                                                                        |
| 4:00  | 5:00  | Dean of Science<br>P Kench                                                                                                                                                                       |

**Thursday March 12, 2020**

|       |       |                                                                                      |
|-------|-------|--------------------------------------------------------------------------------------|
| 9:00  | 9:30  | Social Science Applications Group<br>J Hu, T Loughin, H Perera, T Swartz, S Thompson |
| 9:30  | 10:15 | Associate Dean of Graduate Studies<br>Zoe Druick                                     |
| 10:15 | 10:45 | Undergrad program chairs<br>H Perera, J Cao                                          |
| 11:00 | 11:30 | Undergrad Students<br>J Klein, PI Tuttosi, C Sobczak, N Dyrkton, ZYO Yang, J Braun   |
| 1:30  | 2:00  | Grad students<br>C Karunarathna, N Surjanovic, R Doig, M Sun, P Tea                  |
| 2:00  | 2:10  | Grad program Chair<br>J Graham                                                       |
| 2:10  | 2:30  | Grad Students<br>C Ng, P Nikchi                                                      |
| 2:45  | 3:15  | Service teaching<br>M Loughin, S Pai, G Yapa, H Perera                               |
| 3:45  | 4:30  | AVP Research<br>D O'Neil                                                             |

**Friday March 13, 2020**

|       |       |                                                                                                         |
|-------|-------|---------------------------------------------------------------------------------------------------------|
| 9:00  | 9:30  | Junior faculty<br>L Elliott, J-F Bégin, L Wang, H Perera, D Stenning                                    |
| 9:30  | 10:00 | Theoreticians<br>J-F Bégin, R Lockhart, B Tang                                                          |
| 10:00 | 10:30 | Large Scale Computational Group<br>D Bingham, J Cao, L Elliott, J Graham, B McNeney, D Stenning, L Wang |
| 11:15 | 11:30 | CANSSI Rep<br>D Bingham                                                                                 |
| 11:30 | 12:00 | Closing meeting with Dept Chair                                                                         |
| 1:00  | 2:00  | Closing meeting with senior administrators<br>W Parkhouse, J Driver, G Nicholls, D O'Neil, B Basi       |

## EXTERNAL REVIEW – ACTION PLAN

### Section 1 – To be completed by the Responsible Unit Person e.g. Chair or Director

|                                                                |                                                         |                                                |                                     |
|----------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------|-------------------------------------|
| Unit under review<br>Statistics and Actuarial Science<br>..... | Date of Review Site visit<br>March 11-13, 2020<br>..... | Responsible Unit person<br>Tim Swartz<br>..... | Faculty Dean<br>Paul Kench<br>..... |
|----------------------------------------------------------------|---------------------------------------------------------|------------------------------------------------|-------------------------------------|

#### Notes

1. It is ***not*** expected that every recommendation made by the External Review Committee be covered by this Action Plan. The major thrusts of the Report should be identified and some consolidation of the recommendations may be possible while other recommendations of lesser importance may be excluded.
2. Attach the required plan to assess the success of the **Educational Goals** as a separate document (Senate 2013).
3. Should any additional response be warranted, it should be attached as a separate document.

### **1. PROGRAMMING**

#### 1.1 Action/s (description what is going to be done):

##### **1.1.1 Undergraduate:**

- Recomm (4) – the Department has submitted (May 2020) its Faculty Renewal Plan which corresponds exactly to the Recommendation; if implemented, this will reduce the Department's massive teaching reliance on sessional instruction
- Recomm (5) – in the coming academic year, the Department is assigning more continuing faculty to teach large service courses and lower division Statistics courses
- Recomm (6) – the Department will consider the cutting of STAT 205 and STAT 341, the combining of STAT 450 with STAT 830, will monitor enrolments in STAT 310 and STAT 311, and the blending of ACMA 440 and ACMA 455 into graduate offerings
- Recomm (7) – although limited by TSSU regulations, the Department will consider additional teaching of courses by senior graduate students
- Recomm (11) – the ActSci group will review the admission criteria for the undergraduate program in actuarial science, and specifically the role of ACMA 210 within it; they will also consider the content and design of the ACMA 210-320-425 sequence to encourage enrolment and retention
- Recomm (16) – when resources permit, we would like to add upper division summer courses to allow students to make progress on their degrees
- Recomm (17) – the TPC will re-visit teaching credit for distance education courses when the teaching landscape stabilizes
- Recomm (25, 26) – data science is an increasingly important area, and the Department will investigate additional programming options in both Statistics and Actuarial Science, and will coordinate the implementation.



**1.1.2 Graduate:**

- **Recomm (12)** – the ActSci group is currently updating the MSc curriculum through the offering of three revised courses; assessment from the courses and input from new faculty will assist in future updates which most likely will include the introduction of a data science option and the offering of joint 400/800 level courses

**1.2 Resource implications (if any):** Recommendation 4 is obviously costly but will be offset some by less need to hire sessional instructors.

**1.3 Expected completion date/s:** Many of the recommendations are under way. Those requiring more consideration (6, 11, 17, 25, 26) will be addressed in the 2020/2021 academic year.

## 2. RESEARCH

The Department thanks the Review team for their appraisal. The Department is especially appreciative of the recognition of the excellence in Research. With the hopeful appointments of continuing Lecturers, we believe that this will enhance our research efforts by allowing researchers to sustain a greater focus on research activities.

### Action/s (what is going to be done):

- Recomm (22, 23) – the Sports Analytics Group (SAG) at SFU has initiated steps towards the formation of an Institute in Sports Analytics; the Department is seen as a key player and supports the initiative

2.1 Resource implications (if any): The Institute will have some costs. We cannot say at this time until a proposal is prepared. However, for programming, SAG does plan to piggyback on some existing courses (eg in Statistics and Computing Science).

2.2 Expected completion date/s: The Sports Analytics Group has initiated preliminary conversations with upper level administrators. It is hoped that in the fall semester of 2020, proposals for the Institute and associated programming will be forthcoming. We see some urgency in this despite SAG's foothold in this area; other universities (e.g. UofT, Syracuse) are making hires and developing programs in Sports Analytics. SAG has also had conversations and has submitted a CRT proposal to CANSSI to help jumpstart the Institute.

## 3. ADMINISTRATION

### 3.1 Action/s (what is going to be done):

- Recomm (9) – the Learning Outcomes process is underway
- Recomm (13) – the Department is currently implementing a mentoring scheme for junior faculty
- Recomm (14, 15) – to improve teaching, the Department will add two tasks to the portfolio of the Associate Chair: (1) – the encouragement of faculty to utilize resources such as the CEE and (2) – the development of an annual program that involves classroom visitations and the review of teaching materials
- Recomm (30) – the Department will work with the Dean's Office to determine appropriate levels of staffing

- a. Resource implications (if any): The extra staffing (Recommendation 30) will require funding and space.
- b. Expected completion date/s: The classroom visitations in Recommendations 14 and 15 will be delayed until face to face instruction resumes.

#### 4. WORKING ENVIRONMENT

4.1 Action/s (what is going to be done):

- Recomm (1) – the Department will work cooperatively with the university and the Faculty of Science to find solutions to the crisis involving lack of office space for faculty
- Recomm (2,3) – noting that new graduate student space is soon to be allocated, the Department will work with graduate students to meet their needs involving study space
- Recomm (31,32) – the Department will work cooperatively with the Faculty of Science to acquire more suitable common room space and a suitable resource room

a. Resource implications (if any):

- b. Expected completion date/s: There is an urgency for space. We are surviving right now because research and teaching are being carried out remotely.

#### 5. .... (OTHER)

5.1 Action/s:

- Professional Masters programs have been investigated in our Department. As recommended by the External Reviewers, a Professional Masters in Actuarial Science must be delayed until programming is sorted out and it is clear that there is a market for such a program. A Professional Masters could be developed in Sports Analytics, but it remains to be seen what sort of programming is best suited for this niche area.

5.2 Resource implications (if any):

5.3 Expected completion date/s:

The above action plan has been considered by the Unit under review and has been discussed and agreed to by the Dean.

Unit Leader (signed)

Date

Name .....

Title.....

.....



## **Section 2 - Dean's comments and endorsement of the Action Plan:**

I thank the committee for a robust and insightful analysis of the strengths and challenges of the Department of Statistics and Actuarial Sciences. Notable is the strong endorsement of the high regard for the department and its increased national standing and the rapid expansion of the education programs. Such success also brings about challenges that are deftly articulated in the review report.

The department has responded to the majority of recommendations and it should articulate a timeframe for consideration and implementation.

**Space.** The report correctly identifies a critical space shortage that constrains existing practice and future expansion. The Faculty has endeavored to find solutions to ongoing space issues affecting Statistics and other departments in the Faculty and has exhausted its own space envelope. The Faculty is committed to working with University administration to seek a more sustainable and long-term solution that will provision the department with necessary spaces and environments for faculty, staff and students.

**Academic programs.** The review makes multiple useful recommendations related to undergraduate and graduate programming, targeted at improved management and delivery of course offerings. The recommendations span additional faculty hires, curriculum rationalization, different models to deploy continuing faculty across the teaching program, and improved articulation of learning outcomes of courses.

**Hiring.** The Faculty is supportive of plans to expand the lecturer compliment of faculty in the department in order to support lower division education programs. It is also important that the department follow through on recommendations to rationalize curriculum and balance existing faculty across the teaching programs in order to manage and ensure quality education delivery.

**Staff.** The Faculty commits to reviewing the staffing support to the department that is consistent with similar functions and levels in departments across the Faculty of Science.

**New opportunities.** The review report provides some helpful suggestions on new program opportunities that build on existing expertise in Data Science. The Faculty endorses these suggestions. In particular, development of expertise and programming in sports analytics could be a promising avenue to explore. It recommends that a professional graduate program in Actuarial Science is not pursued at this time, until the existing programs are modernized.

**Faculty Dean**



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**Date**

**14 August 2020**

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# **Educational Goals Assessment Plan**

## **Benefits to Faculty:**

The plan will provide analysis that may assist our current teaching efforts and future directions for instructional development.

## **Benefits to Students:**

Following implementation of the plan, students may experience a more cohesive progression through our programs. The mapping of courses to Program Educational Goals may provide students with a greater understanding of our educational mission.

## **Next Steps:**

As required for the External Review, the Department of Statistics and Actuarial Science has developed Program Level Educational Goals.

The next step involves the formation of a new Educational Goals Committee that will study the syllabus of each course offered by the Department. The Committee will provide mappings from courses to the Program Educational Goals. Specifically, this step is referred to as Aligning Educational Goals to Curriculum where:

(1) course topics will be identified which satisfy Program Educational Goals

(2) the means by which acquisition of the skills and theory associated with the course topics will be provided

(3) Program Educational Goals which are not covered in courses will be identified

### **More on (2) and (3): Assessing Success of Educational Goals**

**Undergraduate Programming** – Evaluation of the implementation of Educational Goals will be assessed by (a) optional textbook questions, (b) assignment problems, (c) Clicker responses in some large courses, (d) midterms, (e) presentations (oral and/or written) in some upper year courses and (f) final exams. In addition, the Department of Statistics and Actuarial Science will develop an exit survey for undergraduate students to provide a self-assessment of whether Educational Goals were met. The feedback will inform the Department to review and possibly modify course content.

**Graduate Programming** – Assessment in graduate courses will be similar to undergraduate programming without the use of Clicker methodology. Greater emphasis will be given to presentations (oral and/or written) and exams may sometimes be offered in a take-home format to allow for more in-depth examination.

With respect to programming in Actuarial Science (both undergraduate and graduate), the Department will review student results related to the professional exams of the Society of Actuaries (SOA).

### **Timeline:**

October-December 2019 - Educational Goals Committee determines Program Educational Goals

December 2019 - Department approves Program Educational Goals for External Review

March 2020 - External Review

May 2020 - External Review Report received

June 2020 - Action Plan prepared based on External Review Report

September-December 2020 - Educational Goals Committee maps courses to Program Educational Goals

2021 onwards - assessment of student achievement with respect to Educational Goals which involves data collection and analysis