

Mathematics & Statistics Program Review

Faculty of Science

Dean's Summary

Submitted by:
Dr. Lucy Lee, Dean of the Faculty of Science

Accepted by:
Senate in January 2019
Academic Planning and Priorities Committee in November 2018

Department of Mathematics & Statistics Program Review Implementation Recommendations in Response to Reviewers' Suggestions and Unit Responses

Prepared by Lucy Lee, Dean, Faculty of Science

05/11/18

Executive Summary

The Department of Mathematics & Statistics (Math & Stats) at the University of the Fraser Valley aims to maintain excellent student-centred instruction for students from all programs. They strive to provide students with a thorough exposure to key areas of modern mathematics and statistics.

The Math & Stats Department is a unit of the Faculty of Science, staffed by 14.8 permanent faculty (9.8 FTE teaching instructors in the area of Mathematics and 5 in Statistics), 1 FTE departmental assistant, as well as a fluctuating number of sessional instructors either as LTAs or part-time instructors. Note that at the time of the review, the department had 13.8 permanent faculty, as a new hire in Mathematical Education was done since.

The UFV Math & Stats department, offers the following programs:

- Mathematics major (for BSc and BA students)
- Mathematics major (Honours) (for BSc students)
- Mathematics extended minor (for BA students)
- Mathematics minor (for BA and BGS students)
- Mathematics minor (for BSc students)
- Mathematics minor (for BCIS students)
- Mathematics minor (Statistics Option)
- Applied Statistics minor
- Post-baccalaureate Certificate in Data Analysis

They provide instruction to an average of about 50 Math majors and minors combined, as well as over 400 FTE students in other programs as service teaching. Total enrolments in all courses offered by Mathematics & Statistics range between 3100 to 3600 students annually (within the past 6 years) with roughly 80% being domestic students. Number of sections offered has been greater than 100 since 2012, with most enrolments being at the 100 level courses (>90%). Contact hours for these courses have been 50 to 60 hours each per semester, thus the workload for Math & Stats faculty is 6 units per academic year. See attached Self Study Report for details (doc 2).

The Mathematics & Statistics Department has produced graduates with solid credentials, but the number of graduating students has been few. Their students have had a high rate of placements either in the workforce or in post-graduate programs like Master's and Ph.D's, or into post-graduate certificates like the Data Analysis certificate (DAC), or onto professional programs like engineering, teaching and administration. Although the cohort of graduating students from DAC is still relatively small, this is becoming popular and most graduates have found placements within this growing and demanding field.

The Program Review Panel consisting of faculty from two research universities, a special purpose teaching university, and a private university, all in British Columbia, reviewed the Mathematics & Statistics Program Review documentation and interviewed faculty, staff and students during a site visit on May 8 - 9, 2018. Their report (doc 3) was made available in early June and subsequently released to the department for their response. Overall, the reviewers praised the Math & Stats department noting: "Overall the review panel found much positive to report about the department and the academic programs it offers. The curricula of courses and programs appear to be solid and current in terms of content, with a high level of rigour. Faculty members, both permanent and sessional, are very well-qualified and appear dedicated to offering a supportive teaching and learning environment in their classes. There is a strong sense of community in the department. Moreover, the department engages in creditable outreach work involving local schools and indigenous communities." The panel provided 14 minor recommendations for which the unit prepared their responses and implementation plans (doc 4) and submitted these on September 18, 2018.

Action Plan on Recommendations and Implementation Schedule

The greatest strengths of the Department of Math & Stats are its dedicated and committed faculty members, consistently high quality of instruction (as reported by students), small class sizes, the Math and Stats Centres (in the main campus in Abbotsford and at CEP in Chilliwack), well-balanced math and stats programs, variety of outreach initiatives for K-12 students and their teachers and parents, and the opportunities for meaningful engagement in the discipline by program students. Challenges identified by the department and concurred by the review panel were: 1) low success rates in many of the lower level courses for which a change in instructional tactics may be beneficial; 2) the lack of students enrolled in the majors/honours program and related difficulty in offering upper-level Mathematics & Statistics courses; 3) a need for more space (office, teaching and service) for faculty and students, especially the need for more computer labs; and 4) a need to expand scholarly/research capability within the university and beyond.

Most of these have been or are being addressed, especially with the hiring of a new faculty member in Mathematics with a specialty in Math Education, and the ability to create a new faculty position in Statistics for 2019 to address the concerns regarding expanding scholarly and research capability. However, the infrastructure needs, especially for physical space are pressing. This is a problem that is echoed through-out the Faculty of Science and the University at-large, and this is an issue that needs a major infrastructure fundraising campaign at the institutional level.

The detailed Unit responses are attached along with my comments and suggestions with tentative schedule for implementation.

MATHEMATICS & STATISTICS

Program Review

Scope & Action Plan Report

Submitted by:

Lucy Lee, PhD
Dean, Faculty of Science
University of the Fraser Valley

Date: Nov. 05, 2018

The following are the recommendations of the review panel (in bold) and their suggestions (*in italics*). Below these are my comments (in blue) based on the departments' response and further action plans needed if any (in green).

- 1. The department should undergo a review of its pedagogical practices and where necessary revise approaches to teaching and learning to align with contemporary evidence-based, student-centered pedagogy and the institution's stated goals.**

It is strongly suggested that external advisors assist the department with the above. Ideally such an individual (or individuals) is both a discipline specialist and experienced in applying evidence-based pedagogy in undergraduate teaching.

The department of Math & Stats responded with 4 initiatives to enhance Math pedagogy:

- 1) **Bi-weekly pedagogical discussions** under the catchy tune of "Math Matters, Stats Counts" with internal and/or external guests to share innovative ideas/techniques for effective teaching and learning. This has already been implemented and the discussion group which started as "Math Matters" is active.
- 2) **Peer classroom visits**, on a voluntary basis, that would be mutually beneficial to both 'observee' and observant to learn and share innovative teaching strategies.
- 3) **Survey students outside of formal student evaluations**, which would provide a measure of effectiveness of pedagogical practices. The department suggests having a repository of such surveys in the department drive and to meet in May 2019 to discuss findings.
- 4) **Creation of a brief introduction to who is who in the Math & Stats department with what their classroom approaches are**, to post on the departmental website, to inform students of various instructional styles. This is in the works and plans are in place to have it ready for Fall registration in 2019.

Dean's response/Action plan: The department of Math & Stats is revising its pedagogical practices as noted above. Additionally, faculty have an excellent resource in the Teaching and Learning Centre (UFV-TLC) with a wide variety of services/resources/events to facilitate teaching and learning aligned with contemporary, student-centered pedagogical approaches. Furthermore, several Math instructors along with other UFV faculty and various community members, have begun coordinating a new initiative in Math Education to support, enhance and improve student success, especially for indigenous students. They plan an annual gathering event (a Sq'ep, in Halq'eméylem, the language of the Stó:lō people) which will be first piloted in February of 2019. They have also applied for a Fund for Innovation to support this strategy for future years. I am fully supportive of all of the above strategies and hope to see better success rates in student performance in the math courses, especially in the 100 level courses.

Schedule for implementation: ongoing.

2. To better support student learning and the implementation of evidence-based, student-centered pedagogy, the department should create detailed learning outcomes for each course.

As with (1), the department may need some assistance in devising learning outcomes that are sufficiently granular and clear as to be most helpful to students. It is probably best to start the process with 1xx courses, with small teams of experienced teachers working together to formulate the outcomes over a period of a year.

The department of Math & Stats indicated that faculty teaching 100-level courses will discuss and identify “granular” learning outcomes in the various Math& Stats 100 level sections, and will meet in the summer of 2019 in ‘curriculum’ teams to share/discuss/merge learning outcomes in a common core learning objectives for the 100 level courses.

Dean’s response/Action plan: I am also supportive of the above approach which could be done as part of their annual retreat meeting or as a separate meeting which could be arranged with TLC. Several department members have already created detailed learning outcomes for their own use in teaching.

Schedule for implementation: ongoing, but expect to have several of the first-year courses done by Fall 2019.

3. Monitor data that are accessible on MATH/STAT 1xx courses with the aims of measuring student engagement and identifying what measures, if any, can predict non-completion.

Attendance at classes is not routinely monitored by the department, but is not time-consuming to do. Linking to (1), it is feasible that after an activity-based class students hand in work that could be used to record attendance and participation. Online homework systems such as WeBWork, if assigned weekly, give ready access to information on student engagement outside of class. Some of these measures may be useful in predicting when a student is at risk of non-completion, and possible interventions explored. Data collected may also shed light on levels of student engagement and interest.

Math & Stats faculty have already begun to address this, and have proposed to individually collect data over this academic year (agreed upon at their summer retreat held Aug 23, 2018). They then plan to share what each individual faculty collected at the next retreat, and discuss what they learned, how useful the data collection methods were, etc. This will help towards adopting common data collection methods that are effective.

Dean’s response/Action plan: The office of Institutional Research could also be engaged to facilitate this as well as perhaps engaging Data Analysis Certificate students as part of their program projects.

Schedule for implementation: Summer 2019.

4. The Data Analysis Certificate should be continued to be supported, though ways to increase enrolment and to improve the attractiveness of the courses should be explored.

The addition of the co-op may prove a great boon for the DAC, and the department may wish to consider an industry advisory panel to support the co-op and improve links with industry. Courses presently in the DAC program may also be attractive to students in existing programs, and could also integrate well with new programs (such as a possible Business Analytics degree and other new masters programs at UFV). Ramping the DAC up to a diploma should also be considered.

The Math & Stats department introduced the Co-op stream to DAC and a significant increase in this program’s intake was noted for the current academic year.

Dean's response/Action plan: This is actually proving very attractive to foreign students and currently there is a surge of applicants to more than double of what was observed in previous years. The demand on faculty to teach DAC courses as well as providing support to the Math & Stats Centre and the increasing enrolments in 100 level Stats courses has identified a major need to increase the Stats teaching faculty. Thus, a new permanent Stats faculty position request has been made which has been tentatively approved pending budget finalization.

Schedule for implementation: Fall 2019.

5. The department is encouraged to liaise with other departments at UFV to explore possible collaborations and synergies.

The department has much to offer both students and faculty in other units. There are obvious areas of shared interests with CIS, Education, Economics, Psychology, and Business, to name just a few.

The Math & Stats department have already been liaising with other departments at UFV, including Agriculture, Biology, Geography, Teacher's education program, to name a few. They plan to further enhance this by investigating possibility of joint majors with Economics, Physics, Computer Science, and Chemistry.

Dean's response/Action plan: With the addition of a new full time position in Stats, it is possible to reactivate a Statistical Consulting Centre that could bring new collaborations with faculty researchers in other departments as well as with the community at large.

Schedule for implementation: ongoing.

6. Faculty in the department should attempt to raise their visibility outside of the university by, for example, further involvement with professional bodies, conferences, and other institutions. It will be difficult for the university to meet its stated aims unless faculty members are engaged in the broader academic community. Active membership in relevant professional bodies is one way faculty can achieve this goal.

The Math & Stats department members have begun planning an annual Fraser Valley Conference on Indigenous Math Education as noted in 1 above, and this is expected to grow and attract Math teachers at the provincial and national levels. Many faculty also use professional development funds to participate in conferences as well as joining in various professional bodies in their various disciplines.

Dean's response/Action plan: Faculty will be encouraged to become more actively engaged with professional bodies relating to their disciplines as well as enhance attendance to conferences and becoming active participants. Many faculty are already involved in professional bodies outside of UFV.

Schedule for implementation: ongoing. Annual Indigenous Math Education conference to begin February of 2019.

7. Where possible, the department should seek professional and external accreditation for its courses and programs.

For example, the university offers courses that collectively could be accredited for A. Stat recognition by the Statistical Society of Canada. Such recognition could be attractive to potential students and raise the profile of the department.

The department will seek to establish formal recognition of their courses by the Canadian Institute of Actuaries through their University Accreditation program.

Dean's response/Action plan: Faculty will be encouraged to consult with the Statistical Society of Canada to determine which UFV courses could be accredited for Associate of Statistics recognition and accreditation. This could be facilitated by the addition of a new permanent Statistics faculty to the department's roster as noted above under recommendation 4.

Schedule for implementation: ongoing.

8. Revisions to minor programs should be considered with a view to reducing the lower level requirements.

The stipulated requirements on certain minor programs offered by the department look overly onerous and could probably be pruned down. A reduction in the courses required may entice more students to consider these minors.

The department is in agreement that the requirements for certain minor programs could be scaled back.

Dean's response/Action plan: A working group will be struck to follow through on this and bring resulting changes to the curriculum committee for approval through the various levels at the university.

Schedule for implementation: ongoing, expected completion by 2020.

9. The department should be supported in its work in staffing the Math and Stats Centres; the staffing of these centres should be reviewed by the department within the general framework of supporting students on MATH/STAT courses at the university.

Demand for the Math and Stats centres indicates the need for the support the centres offer. Yet staffing these centres makes heavy demands on the department, particularly regarding support for STAT courses. The department may explore reallocation of existing resources or, at a modest further expense, recruiting additional student monitors. Although training is provided for the student monitors, this could be expanded to further improve their professional development.

The department recognizes the need to improve staffing of the Math and Stats Centres, especially to support the Stats courses.

Dean's response/Action plan: As noted in response to recommendation 4, a new faculty hire in Statistics should be able to support this need. Two extra releases will be provided to facilitate this. Student monitors will continue to be hired to support the work of the Centres.

Schedule for implementation: Fall 2019.

10. The department should expand and refine its use of technology in its teaching, where possible making use of resources that come at little or no cost to students.

The review panel does not suggest the department lags greatly behind in its use of technology. On the contrary, initiatives already proposed by the department are steps in the right direction. In particular, the department should be supported in its use of the WeBWork online homework system and its efforts to modernize MATH classes using software such as Maple and Sage. There are other resources well worth considering, such as Piazza, personalized response systems, typesetting software, and online visualization tools. The statistics faculty members are encouraged to formulate a cohesive policy for the use of software in STAT courses. The department should also look into the possibility of students using their own computers in MATH/STAT classes.

The Dean's office has been facilitating this and faculty have been open to adopting and refining the use of new technologies.

Dean's response/Action plan: The department's response adequately addresses this concern. One time funds will be made available to purchase appropriate resources, including for example student licenses for Maple. Additionally, UFV's Teaching and Learning Centre has been closely collaborating with faculty to expand and facilitate use of technologies.

Schedule for implementation: ongoing.

11. The university should continue to provide teaching spaces that are conducive to student-centered learning, and be responsive to requests from the department relating to inexpensive modifications to rooms and their fittings.

Classrooms the review panel observed were of a good standard and spacious for the size of classes the department teaches. A complaint was raised about the location of the projection screen in some rooms, and the panel accepts that this should be addressed. Computer labs were well equipped, but the department may wish to revisit the layout and provision in these rooms if moving to active-learning pedagogy. Related to (10), the university should ensure that wireless internet access is reliably available across each campus.

A designated room for Math & Stats courses has been assigned in D-219.

Dean's response/Action plan: Lap-tops were purchased for student use. Wireless support is being investigated. A dedicated computer lab is being sought that could be designated for priority use for Math & Stats courses. Additionally, more whiteboards and smart boards are being sought to be added to computer labs and classrooms.

Schedule for implementation: ongoing.

12. The university should explore ways in which the faculty in the department can be accommodated in offices that are in closer proximity than at present.

The scattering of offices across the D building and the T block is not conducive to personal interactions either between faculty or between faculty and students. Even within the D building the departmental offices appear distributed haphazardly.

It is desirable that a centralized physical community for Math & Stats faculty would become available, however, based on current physical space availability, the Math & Stats faculty are satisfied with their office allocations.

Dean's response/Action plan: As spaces in the D building become renovated, we will strive to find a closer physical area for offices and meeting spaces for the department of Math & Stats.

Schedule for implementation: Completion of renovations of the D-building shell, currently scheduled for 2019-2021) will bring along renovated spaces for faculty by 2021.

13. The department should explore consulting and collaborative research opportunities, both within the university and beyond.

The department has much expertise to offer to support both research and commercial ventures. Such expertise should not routinely be given away freely, and any benefits from such activities should be mutual. If the university is committed to decisions regarding teaching being evidence-based, the department is well-placed to contribute to pedagogical research that can inform best practice.

The Math & Stats faculty proposes to reactivate a Statistical Consulting Centre that could provide linkages with the university community and beyond.

Dean's response/Action plan: As per recommendation 5 and 6 above, the Math & Stats faculty are striving to make collaborative opportunities within and outside the university, and with the addition of a new faculty in Statistics as per 4 above, the possibility of reactivating the Statistical Consulting Centre will become more feasible.

Schedule for implementation: ongoing.

14. Faculty in the department should be encouraged to achieve their career goals and progress through the academic ranks.

Criteria for faculty standards at the various ranks are quite new at the university, having been approved by the senate in 2015. It is not clear why both university and departmental criteria exist, nor whether that will cause problems, but such matters are beyond the scope of this review. The review panel hope that faculty in the department will be encouraged to attain their career goals by progression through the ranks were appropriate. For a department of its size, at least one full professor would be a reasonable expectation.

The department members are in agreement that they will support those who apply for rank advancement without prejudice.

Dean's response/Action plan: This will be based on performance and the Dean will encourage those that are deemed to advance through the ranks to apply for promotion as desired.

Schedule for implementation: ongoing.