

Cyclical Program Review of Academic Programs offered by the Department of Mathematics and Statistics

Progress Report on Implementation Plan: 4-year

Date: 3/28/2022

Contact: Troy Day Department Head day@queensu.ca

Programs	Degrees
Mathematics and Statistics	MSc, PhD
Mathematics	BA, BAH, BSc, BScH, MA, MASc
Statistics	BA, BSc, BScH
Mathematics and Engineering With the Depts. Of Mechanical & Materials Engineering, Electrical & Computer Engineering, and School of Computing	BASc, BASc with PI, MASc, PhD

Table 1 Add/delete rows as required

At the conclusion of the cyclical program review, a final assessment report and implementation plan was agreed by the Teaching and Learning Office and the Deans of the Faculty of Arts and Science and the School of Graduate Studies. These deans are responsible for monitoring the implementation plan. This report is an important step in the overall cycle of continuous improvement and is an opportunity to reflect on, and document, the progress made on incremental improvements to address recommendations in the implementation plan.

Please complete the table below to report on progress made in the past 4 Years against the implementation plan. Add further explanation, if necessary, in the *additional notes* section.

Please complete this report and return it to qugap@queensu.ca by 2/25/2022. The Teaching and Learning Office will review this progress report. It will then be appended to the Deans' annual reports for the 2021-22 academic year, filed in the Office of the Provost and Vice-Principal (Academic). Please note that monitoring reports will be posted on the University web site.



Apr 1, 2022

Signature of Unit Head

Date



Barbara Crow

April 26, 2022

Signature of Faculty Dean

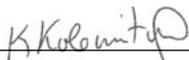
Date



April 28, 2022

Signature of Dean (SGS)

Date



May 3, 2022

Signature of Associate Vice-Principal (Teaching and Learning)

Date

Recommendations 1 and 2 were reported on in the March 2020 report and noted as complete (see March 2020 report).
 Recommendation 7 is the purview of the Provost and Vice-Principal (Academic) and not included in this report.

Recommendation 3: Identify program learning outcomes for the BSc Statistics program and update the program requirements accordingly.	
Proposed follow-up	Incorporate identification of program learning outcomes and updates to the BSc Statistics program as part of the comprehensive curriculum review.
Responsibility for leading follow-up	Department Head
Timeline for addressing recommendation	Fall 2018
Are there additional deliverables associated with the proposed follow-up?	No
Which support units have been engaged as collaborators in supporting additional deliverables? (If no, please indicate 'N/A')	N/A
What is the current status of the follow-up? Include a completion percentage	Completed ** *Please see end of document for updated implementation information provided at the request of the Senate Cyclical Program Review Committee in October 2022*** >75%

<p>Please provide a brief description of the current, completed or planned work</p>	<p>We have added several courses to the program, including STAT 252 which is designed for Medials and Minors, as well as STAT 362 ('R for Data Science'), STAT 466/866 ('SAS Programming'), STAT 456/856 ('Bayesian Analysis'), and STAT 457/857 ('Statistical Learning'). That said, current staffing shortages in Stats and budget constraints mean that these courses are not always offered. We are also in the process of discussing an introductory course in Data Science. There is likely a high demand for such a course but again current staffing shortages due to budget constrains have prevented us from taking this further at the moment.</p>
<p>Recommendation 4: Inject new resources into the BASC Mathematics and Engineering program to accommodate a tripling of enrolment</p>	
<p>Proposed follow-up</p>	<p>Department Head to work with the Faculty of Arts and Science to increase faculty positions as part of the ongoing faculty renewal initiatives</p>
<p>Responsibility for leading follow-up</p>	<p>Department Head</p>
<p>Timeline for addressing recommendation</p>	<p>Hiring in 2018-19 for Fall 2019 start</p>
<p>Are there additional deliverables associated with the proposed follow-up?</p>	<p>Yes</p>
<p>Which support units have been engaged as collaborators in supporting additional deliverables? (If no, please indicate 'N/A')</p>	<p>N/A</p>
<p>What is the current status of the follow-up?</p>	<p>In process</p>

Include a completion percentage	75%
Please provide a brief description of the current, completed or planned work	Enrollment numbers have dropped and stabilized to a somewhat more manageable level. We have also hired a 3-year term faculty member (Kexue Zhang) which has helped to alleviate some of the strain in the short term. What have re-organized some of our course offerings to make the program more sustainable. For example, in the coming year MTHE 334 will no longer be offered and MATH/MTHE 328 ('Real Analysis') will take its place (the latter is already a regular offering). A review of all EngSci programs at Queen's was also conducted recently (The Cluett Report) and we will be continuing to work with our FEAS colleagues to implement parts of this report as appropriate.

Recommendation 5: Actively recruit research statisticians to the faculty and hire a program coordinator for the BSc Statistics program.	
Proposed follow-up	Department Head to reassess needs once learning outcomes for the BSc Statistics program have been approved by Arts and Science Curriculum Committee
Responsibility for leading follow-up	Department Head
Timeline for addressing recommendation	Winter 2019
Are there additional deliverables associated with the proposed follow-up?	No
Which support units have been engaged as collaborators in supporting additional deliverables? (If no, please indicate 'N/A')	N/A

What is the current status of the follow-up?	Completed
Include a completion percentage	75%
Please provide a brief description of the current, completed or planned work	There is no current plan to hire a program coordinator and, given current budget constraints, this is unlikely to change in the near future. We recently hired two statisticians (Song in 2019 and Ling in 2020). We also attempted to secure another position in statistics to deal with current understaffing but were unsuccessful.

Recommendation 6: Increase the number and range of graduate courses offered.	
Proposed follow-up	Department Head to work with graduate committee to develop full complement of graduate courses
Responsibility for leading follow-up	Department Head
Timeline for addressing recommendation	Offer some new graduate courses in 2019 with an aim for fuller implementation by 2020
Are there additional deliverables associated with the proposed follow-up?	Yes
Which support units have been engaged as collaborators in supporting additional deliverables? (If no, please indicate 'N/A')	N/A

What is the current status of the follow-up?	In process
Include a completion percentage	75%
Please provide a brief description of the current, completed or planned work	We have added several courses as detailed in the previous report but we still believe that more needs to be done to address this issue. COVID has delayed our plans somewhat but we intend to add approximately two more courses per year from a rotation list of specialized options.

Recommendation 8: Pay special attention to the collaborative Biostatistics program in order to be able to participate in the Big Data revolution.	
Proposed follow-up	Consider role of collaborative Biostatistics program as part of upcoming departmental strategic planning exercise
Responsibility for leading follow-up	Department Head
Timeline for addressing recommendation	Complete strategic plan in 2018. Implement by 2019-20 academic year
Are there additional deliverables associated with the proposed follow-up?	No
Which support units have been engaged as collaborators in supporting additional deliverables? (If no, please indicate 'N/A')	N/A

What is the current status of the follow-up?	Completed
Include a completion percentage	100%
Please provide a brief description of the current, completed or planned work	Our recent hires in stats discussed above have helped to address this concern.

Recommendation 9: Implement training sessions for new postdoctoral fellows and assign mentors for them. Create a faculty handbook for the postdoctoral fellows.	
Proposed follow-up	Initiate meeting with representatives from the School of Graduate Studies and Human Resources. Create a training session for mentors to ensure they are properly trained and aware of postdoc's collective agreement and other policies.
Responsibility for leading follow-up	Department Head in conjunction with School of Graduate Studies and Human Resources
Timeline for addressing recommendation	Implement by 2019-20 academic year
Are there additional deliverables associated with the proposed follow-up?	Yes
Which support units have been engaged as collaborators in supporting additional deliverables? (If no, please indicate 'N/A')	N/A

What is the current status of the follow-up?	In process
Include a completion percentage	50%
Please provide a brief description of the current, completed or planned work	<p>COVID delayed our plans with this but we are currently in the process of putting together a handbook for new postdocs.</p> <p>Comments from the Dean of SGSPA: Training for new postdoctoral fellows are now provided by the School of Graduate Studies and Postdoctoral Affairs. The Postdoctoral Coordinator will be happy to assist the program in creating a faculty handbook for postdoctoral fellows.</p>

Recommendation 10: Develop a well-articulated, long-term strategic hiring plan, in response to shortage of statistics and engineering faculty in the unit	
Proposed follow-up	Establish working group to develop the department's strategic plan that includes a hiring plan which will guide the department for the next 3-5 years
Responsibility for leading follow-up	Department Head
Timeline for addressing recommendation	Complete strategic plan in 2018. Implement by 2019-20 academic year
Are there additional deliverables associated with the proposed follow-up?	Yes
Which support units have been engaged as collaborators in supporting additional deliverables?	N/A

(If no, please indicate 'N/A')	
What is the current status of the follow-up?	In process
Include a completion percentage	50%
Please provide a brief description of the current, completed or planned work	COVID delayed our plans with this but we are currently in the process of drafting a detailed strategic plan for our department.

Additional Information on Implementation of Recommendation 3, submitted to SCPRC October 2022

Recommendation 3: Identify program learning outcomes for the BSc Statistics program and update the program requirements accordingly.

Summary of Information from Department Head Troy Day: (summarized by SCPRC Secretary Claire O'Brien)

The program learning outcomes were established based on the course content. The Centre for Teaching and Learning was not consulted during the development of the program learning outcomes.

The department is currently developing a strategic hiring plan, which involves revisiting our programs and course offerings and making revisions to ensure that they are all attractive, appropriate, and central to achieving our goals. We are in the process of doing all this right now and the outcome will likely supersede this review document.

Program Learning Outcomes

DEPTH AND BREADTH OF KNOWLEDGE

(1) Demonstrate Computational Proficiency

STAT 252 - compute probabilistic quantities

STAT 362 - mastering the use of the statistical analysis software, R

STAT 466/866 - mastering the use of the statistical analysis software, SAS

STAT 457/857 - mastering the computational aspects of different approaches to machine learning

(2) Analyze Examples and Discovering Common Phenomena

STAT 457/857 - using machine learning to uncover patterns

(3) Set Problems Clearly, Articulate Assumptions and State Precise Definitions

STAT 456/856 - understanding the distinction between Bayesian and classical statistics

(4) Articulate Precise Mathematical Statements

STAT 362 - understanding the relationship between statistical ideas and the syntax used in R

STAT 466/866 - understanding the relationship between statistical ideas and the syntax used in SAS

(5) Use Mathematical Reasoning to Infer Logical Conclusions

STAT 252 - understanding random variables and their relationship to distributions

STAT 456/856 - understanding the distinction between Bayesian and classical statistics

(6) Construct and Analyze Proofs

(7) Transfer Ideas and Methods Between Different Branches of Mathematics

STAT 456/856 - understanding the distinction between Bayesian and classical statistics

STAT 457/857 - using various mathematical ideas to understand the rationale for methods of machine learning

(8) Understand Mathematical Structures

KNOWLEDGE OF METHODOLOGIES

(9) Select Appropriate Mathematical Models and Tools

STAT 252 - understanding which random variables apply in different contexts

STAT 362 - determine the appropriate way to analyze data

STAT 466/866 - determine the appropriate way to analyze data

STAT 456/856 - determine when Bayesian analysis is appropriate

STAT 457/857 - determining which machine learning method is appropriate to given situations

(10) Demonstrate Proficiency in Using Sophisticated Mathematical Models in Analysis of Problems

STAT 362 - analyzing real-world data

STAT 466/866 - analyzing real-world data

STAT 456/856 - analyzing real-world data

STAT 457/857 - analyzing real-world data

APPLICATION OF KNOWLEDGE

(11) Analyze Data to Draw Valid Conclusions

STAT 362 - analyzing real-world data

STAT 466/866 - analyzing real-world data

STAT 456/856 - analyzing real-world data

STAT 457/857 - analyzing real-world data

(12) Validate Experimentally Mathematical Models and Techniques

STAT 457/857 - validate machine learning methods

(13) Understand Limitations of Mathematical Models Through Experimentation and Simulation

STAT 252 - understanding how the limitations of commonly used probability distributions

(14) Compare, Analytical, Visual, and Numerical Perspectives in Exploring Mathematics

STAT 252 - Plotting the shapes of different probability distributions and linking them to the interpretation of associated random variables

STAT 362 - compare visual versus analytical outputs in data analysis

STAT 466/866 - compare visual versus analytical outputs in data analysis

(15) Identify and Model Essential Features of a Complex Situation, Modify Models as Necessary for Tractability and Draw Conclusions

COMMUNICATION SKILLS

(16) Demonstrate a Capacity for Leadership and Decision-making

(17) Work Creatively and Self-sufficiently with Mathematics

(18) Use Graphics Appropriately to Explain, Interpret, and Assess Information

STAT 362 - presenting summary data to best illustrate the conclusions of statistical analyses

STAT 466/866 - compare visual versus analytical outputs in data analysis

STAT 457/857 - determine most suitable way to visualize output of machine learning results

(19) Reference Literature and Acknowledge Previous Work

(20) Prepare and Deliver Written and Oral Presentations

AWARENESS OF LIMITATIONS OF KNOWLEDGE

(21) Acquire Skills Needed for Life-long Learning

(22) Evaluate Information for Authority, Currency and Objectivity

STAT 252 - understanding how stochasticity factors into everyday situations

STAT 362 - analyzing real-world data

STAT 466/866 - analyzing real-world data

STAT 457/857 - understand the limitations of machine learning methods

AUTONOMY AND PROFESSIONAL CAPACITY

(23) Demonstrate Professional Autonomy and Responsibility

(24) Communicate Mathematical Ideas and Audiences of Varying Mathematical Sophistication