

Final Assessment Report for the 2023-2024 Cyclical Review of the Mathematics Programs

INTRODUCTION

In accordance with Laurier’s Institutional Quality Assurance Procedures ([Policy 2.1](#)), this Final Assessment Report provides a summary of the cyclical program review process for the undergraduate and graduate programs in the Department of Mathematics, prepared by the Quality Assurance Office, along with an identification of strengths of the program(s) under review authored by the Dean of the Faculty of Science and the Associate Vice-President and Dean of the Faculty of Graduate and Postdoctoral Studies. All recommendations made by the external review committee in their report are listed, followed by a summary of the units’ response, and the decanal responses. Recommendations prioritized are listed in the Implementation Plan, with those not being prioritized for implementation noted as well.

The Final Assessment Report is reviewed and approved by the Provost and Vice-President: Academic. Following completion of the Final Assessment Report, it is approved by the Program Review Sub-Committee and Senate Academic Planning Committee. Approval dates are listed at the end of this report. Final Assessment Reports are submitted to Senate as part of an annual report on cyclical reviews, and to the Ontario Universities Council on Quality Assurance for information. Final Assessment Reports and Implementation Reports are posted on the public-facing page of the [Quality Assurance Office](#) website.

The Implementation Plan for the recommendations prioritized in the Final Assessment Report can be found at the end of this report. Units will submit their first Implementation Report two years following approval of the Final Assessment Report at Senate. The Implementation Report will include comments from the unit on actions taken toward the completion of recommendations, comments from the relevant Dean(s) related to the progress made, and comments from the Program Review Sub-Committee, which is responsible for approving the Implementation Report and deciding if further reports are required. The Implementation Report is submitted to the Senate Academic Planning Committee for information.

SUMMARY OF REVIEW PROCESS

The last cyclical program review for the Department of Mathematics took place as part of the 2016-2017 review cycle. This was the first review of the BSc in Data Science program and the PhD in Mathematical and Statistical Modelling program.

The primary author of the Self-Study was Dr. Mark Reesor, Chair of the Department of Mathematics. Faculty in the Department contributed to the Self-Study through participation in a retreat focused on the cyclical review process and through an invitation to review the draft Self-Study. In addition to the Self-Study (Volume I), the

Department also submitted a copy of faculty curricula vita (Volume II), a volume of course syllabi, and a list of proposed external reviewers (Volume III). A draft of the Self-Study was reviewed by the Quality Assurance Office, Dean of Science, and Associate Vice-President and Dean of the Faculty of Graduate and Postdoctoral Studies prior to submission of the final version.

Following Laurier's IQAP, the external review committee for the review consisted of two external reviewers from outside the university, and one internal reviewer from Laurier but outside of the unit. The review committee was selected by the Program Review Sub-Committee on November 2, 2023, and an in-person site visit took place on the Waterloo campus on March 27-28, 2024.

The review committee consisted of **Dr. Logan McLeod** from the Department of Economics at Wilfrid Laurier, **Dr. Karen Meagher** from the Department of Mathematics and Statistics at the University of Regina, and **Dr. David Saunders** from the Department of Statistics and Actuarial Science at the University of Waterloo. During the external review, the committee had met with the following individuals and groups:

- Dr. Trish McLaren, Associate Vice-President: Academic
- Dr. Anthony Clarke, Dean of the Faculty of Science
- Dr. Brent Wolfe, Associate Vice-President and Dean, Faculty of Graduate and Postdoctoral Studies
- Dr. Mark Reesor, Dr. Roman Makarov, Dr. Adam Meltzer, Dr. Dave Soave and Dr. Zilin Wang, Department Executive Team (opening and closing meetings)
- Full-time Faculty in the Department representing Mathematics and Data Science
- Ms. Tina Balfour, Manager: Mathematics and Statistics Learning Support
- Mr. Matt Thomas, Head of Collections and Acquisitions
- Mathematics administrative staff
- Mathematics laboratory coordinators
- Undergraduate Mathematics and Data Science students
- Graduate Mathematics students
- Ms. Sally Heath, Manager: Academic Program Development and Review

The review committee was also provided with a tour of the Mathematics laboratory spaces.

The review committee submitted their completed report on April 30, 2024. The executive summary from the report, and its recommendations, are provided below.

EXTERNAL REVIEWERS' REPORT EXECUTIVE SUMMARY

The community in the math department seems very strong and the department enjoys a good reputation on campus. The faculty members' research is strong, almost all have NSERC grants, and several members hold other grants, and there is a good intellectual environment in the department. The department would be strengthened with more work on EDI, including Indigenous content in classes and Indigenous lead.

The move to a multi-campus department is exciting and will open the program up to new students. But administrative support will be needed, especially to offer lab experiences to all students.

The double degree program is very strong, it is attracting strong students and alumni are finding employment. The only concern was getting timely academic advising for their degree. The BSc in Mathematics and Data Analytics (BScMDA) is a new degree, created in response to the current trend in Data Science. The learning outcomes of these two programs are well-defined. The double degree aligns well with the job market and post-graduate employment rates are high. Recent changes to the programs are keeping them modern, but there is concern that this is at the cost of a strong theoretical base. This should be monitored.

Attrition from some of the undergraduate programs seems high. Understanding why these students are leaving and where they are going is important for addressing it. Students suggested one problem might be a mismatch between the actual program and students' expectations.

Like most math departments, WLU's has a large service teaching component. This has forced the size of the undergraduate classes to grow and has left few resources for graduate teaching and supervision.

One strong aspect of the WLU math programs is the extensive use of labs in all the courses, including higher level and graduate classes. This promotes strong experiential learning and a supportive community. The lab instructors seem to be working very well together and integrating the course material well.

The Mathematics and Statistics Learning Support is an excellent resource for students in the WLU math programs, it is well-used and is very well integrated with the department. The use of auto-grading seems very effective and supported by the faculty.

The graduate programs are growing. Most faculty members are active in graduate supervision, although there are concerns that this work is not acknowledged, in particular there are no teaching releases for graduate supervision. Overall, students seem satisfied with program and have a great deal of respect for their professors.

There is concern that there are not enough graduate level classes. Most of the classes are twinned with undergraduate classes, and graduate students are in the same lectures as third year students. There are six areas of concentrations offered in both the Honours BA/BSc in Mathematics and Financial Mathematics and the MSc in Mathematics. This is an efficient use of resources. The graduate rates and times for the MSc are excellent.

The department has a very new PhD program. The attrition rate from this program is currently very high, but this may be due to the pandemic. The few graduates have academic jobs, but this program ought to be monitored.

Everyone spoke about funding concerns. Funding for graduate students and post-doctoral fellows is low, there are CTF and LTA whose positions could be turned into permanent positions, hiring in data science would

strengthen the program. The department is doing well with managing their lack of resources, but longer-term solutions are needed.

RECOMMENDATIONS AND RESPONSES

The External Reviewers' Report included 24 recommendations to improve the quality of the Department of Mathematics programs. All recommendations have been listed verbatim below, followed by a summary of the Department's response, and responses from the Dean of the Faculty of Science and the Associate Vice-President and Dean of the Faculty of Graduate and Postdoctoral Studies.

Recommendation #1: Consider assigning a faculty member to be responsible to learn about current trends in Indigenization efforts in math and statistics across Canada. This person can be a liaison and bring information about Indigenization to the department.

Unit Response: This is an interesting recommendation. Although initially this would not be a formal role (i.e., one with course remission), we will discuss this at an upcoming (2024-2025) Department meeting and see if there is a volunteer willing to lead the Department's Indigenization efforts.

Dean of the Faculty of Science: Indeed, this is an interesting recommendation and if enacted on would likely require some additional resourcing. As a first step, perhaps the Department could reach out to the Office of Indigenous Initiatives for advice and learn of any opportunities to further initiatives.

Recommendation #2: Investigate the feasibility of developing an applied math or statistics class in which the applications are focused on issues of particular interest to Indigenous peoples, such as water quality and management, managing forest fires, mathematics of climate change or climate risk in finance and insurance. A starting point might be to add examples and problems of particular interest to Indigenous peoples to existing classes. There is funding under the collective agreement for EDI, perhaps this could be used here, this could also be the responsibility of the Indigenous lead.

Unit Response: We will investigate if any support is available to pursue responses to Recommendations #1 and #2 through the Office of Indigenous Initiatives or the EDI provisions in the Collective Agreement for Full-time Faculty and Professional Librarians. In 2023-24 the Department offered two special topics courses on "Mathematics of Planet Earth" which introduces models used to describe the earth's physical characteristics, including climate. These courses were at the 300 and 400 level and twinned with graduate course counterparts. We plan to continue offering these courses and will discuss opportunities to introduce a more accessible 200-level course. Additionally, we plan to discuss how to incorporate topics of particular interest to Indigenous peoples into some existing courses. Opportunities for collaborative programming in topics like climate and the environment with other departments (e.g., Geography and Environmental Studies) will be explored. Should a Departmental Indigenous lead be identified, it is envisaged they will help push these initiatives forward.

Dean of the Faculty of Science: The Department's response to this recommendation is entirely appropriate, and I encourage them to explore the possibilities as presented.

Dean of the Faculty of Graduate and Postdoctoral Studies: The Unit has described some excellent starting points for addressing this Recommendation. There may be opportunity to build in applied topics of interest to Indigenous peoples by incorporating examples from researchers affiliated with the GNWT-WLU Partnership: <https://www.wlu.ca/academics/research/partnerships/gnwt/index.html>. Contact ORS to obtain the latest GNWT-WLU Partnership Annual Report for a review of research projects.

Recommendation #3: Organize social events, perhaps paired with seminars or other learning events, with the department to build the community. This is needed especially to strengthen the department's community after the covid restrictions. It might be useful if the event takes the form of peer mentoring in the double-degree program and the data science program (although this cannot be too much work for the senior students). We heard that there is some unused money for social events. Maybe a mentoring event with food would be an effective way to build community and have senior students advise and support junior students.

Unit Response: We can organize such social events for graduate students, which can be linked to some lectures or other activities. In the past, we organized such events for Data Science students and incoming double degree students in the fall term. Perhaps we can find some funding to continue doing it. The Department will discuss the feasibility of these social activities along with the level of interest faculty members have in participating in such activities. The Data Science program has a small budget that made it possible to organize and fund these types of events in the past. Extending this to seminars and our other programs may depend on Faculty of Science support.

Dean of the Faculty of Science: I encourage the Department to follow through with their response.

Recommendation #4: Consider adding an optional co-op to the MSc program in the non-thesis routes.

Unit Response: In years past (i.e., pre-COVID), we considered adding an optional co-op to the MSc program and discussed this with representatives from the co-op office. We plan to have our curriculum committee determine whether the time is right to revisit this option and reconnect with the co-op office to investigate the feasibility of this recommendation.

Dean of the Faculty of Science: Indeed, any action on this recommendation will require coordination and direction from the Co-Op office, given the uncertain capacity of potential employers, and their internal capacity to engage.

Dean of the Faculty of Graduate and Postdoctoral Studies: Building in a co-op option for the MSc program would likely be very attractive to prospective graduate students and increase competitiveness with neighbouring programs. I likewise encourage discussions with the Co-op office to assess feasibility, etc.

Recommendation #5: Re-start the process to create curriculum mappings that was postponed due to the covid pandemic.

Unit Response: We agree with this recommendation, and during the 2024-25 academic year we will re-start the curriculum mappings that were paused due to COVID. This includes updating some of the existing curriculum

maps in view of recent program changes. As curriculum is continually evolving, curriculum maps are living documents that require updating.

Dean of the Faculty of Science: Recognizing the time commitment to engage in this activity, the Department is nonetheless encouraged to complete this initiative.

Dean of the Faculty of Graduate and Postdoctoral Studies: I support the Unit's response to this recommendation.

Recommendation #6: The admissions process for the PhD program should be reviewed. Further support should be provided to ensure that international grades are being evaluated properly in the admissions process.

Unit Response: Our graduate committee will review the admissions process for the PhD program. Furthermore, our Graduate Officer and Graduate Admin will continue to liaise with the Faculty of Graduate and Postdoctoral Studies regarding the evaluation of international grades and transcripts for the purposes of admission.

Dean of the Faculty of Science: While the Department is planning to address this recommendation as advised, I suggest they first determine if the lack of academic strength of entering students is the cause of apparent attrition. If this is indeed known, then appropriate action will be taken. In this regard, the Faculty is investigating the possibility of centralizing such grade evaluations (and other elements of the admission process) to mitigate issues/concerns and help to alleviate workload pressures at the departmental level.

Dean of the Faculty of Graduate and Postdoctoral Studies: During the past couple of years, the FGPS leadership group and staff have provided a suite of training sessions for administrative assistants and graduate coordinators, including in the area of admissions and have specifically offered training in the interpretation and evaluation of international transcripts. Resources have also been made available in our SharePoint site to assist with this admissions activity. Please do not hesitate to reach out to our admissions team for further consultation (Margaret Cooper macooper@wlu.ca; Megan Hancott mhancott@wlu.ca).

Recommendation #7: The initiation of efforts to track undergraduate student performance and link them to the admissions decision (entrance average, high school from which they graduated) should be considered.

Unit Response: We agree with this recommendation as using data to link undergraduate student performance to admissions decisions has been a goal of the Department for some time. However, institutional constraints regarding the availability of data has hampered our efforts along this axis. Through the Dean's office, we will investigate the possibility of making relevant data accessible so as to allow for a proper analysis.

Dean of the Faculty of Science: As noted in the Department's response, access to these data is not simple and requires cooperation and effort by the Office of Undergraduate Recruitment and Admissions. The Faculty will continue to pursue this.

Recommendation #8: As much as possible given resource constraints, expand the scope of the courses covered by the MaSt. This is a very valuable resource to WLU students, which appears to be well-utilized by students in the 100 and 200 level courses.

Unit Response: Although the MaSt works closely with the Department, it is part of Teaching and Learning and so any permanent expansion of the courses supported by MaSt requires their support. In the past couple of years, MaSt has expanded the courses they support to include some quantitative courses offered by other departments, such as computer science. Occasionally, the Math Department assigns Graduate Teaching Assistants (GTAs) to MaSt to provide support for senior-level courses. The Department's ability to do this depends on many factors, particularly the number of available Graduate Teaching Assistantships, which in turn depends on the size of our graduate student enrolment. In principle, expanding the scope of courses covered by MaSt is a good idea, however, only if the students make use of the support. In years past, student use of MaSt support of such courses was marginal and the Department felt those GTA resources could be better utilized elsewhere. Perhaps with a more consistent roster of courses supported each year and with more advertising to the students, there would be better use of the additional support.

Dean of the Faculty of Science: I support the Department's response to this recommendation, and agree with their plan to further promote the MaST availability to upper-year students.

Recommendation #9: Determine how high school students learn about the department's program and revise information sources (such as the department website) to include more information, particularly directed towards high school students, regarding the curriculum of the financial mathematics programs.

Unit Response: We will continue to work with the admissions office on this. We believe that the department's webpage is the main source of information regarding our programs and this typically gets updated annually to reflect any program changes. As noted in the report, it is hoped that the significant changes to the Financial Mathematics program helps to address some of the disconnect between expectations of students when they enter the program and the actual content of the program.

Dean of the Faculty of Science: The Department's commitment to continue working with the Office of Undergraduate Recruitment and Admissions is appropriate.

Recommendation #10: Create the Financial Mathematics Advisory Board, ensuring that this board has strong representation from industry.

Unit Response: We agree with this recommendation. We were recently granted permission from the University's legal team to populate a Financial Mathematics Advisory Board. We plan to create the Advisory Board in 2024-25, with essentially all of its members coming from industry, most of which will be alumni of our programs.

Dean of the Faculty of Science: The Department's positive response to this recommendation is appreciated as it will serve to strengthen the program with respect to both its content and visibility beyond the University.

Dean of the Faculty of Graduate and Postdoctoral Studies: The Unit has responded positively to this recommendation, and this will help to ensure the undergraduate and graduate programs remain current and applicable to industry needs.

Recommendation #11: Continue subscribing to the auto-grading program Gradescope. Explore possibilities for the university to provide permanent funding for this tool and to promote this tool across the university.

Unit Response: We agree with this recommendation and will continue to advocate that Gradescope be approved for permanent and central funding from the university. We will continue to utilize and promote the use of this excellent resource. Finally, note that Gradescope has much more functionality than auto-grading.

Dean of the Faculty of Science: Indeed, the Dean's Office is now working with the Department to facilitate its use across the Faculty.

Dean of the Faculty of Graduate and Postdoctoral Studies: The recommendation has been positively addressed by both the Unit and Dean of Science office.

Recommendation #12: Ensure support for WebWork. There is a server for WebWork that is currently maintained by one of the lab instructors---this is not officially part of their job description. Maintaining this server requires time and expertise, this could be managed through Information and Communication Technologies, or be made a recognized responsibility of a Lab Coordinator. Funding for this position might be joint between the different department that use WebWork, as other departments start to use it.

Unit Response: We agree with the recommendation that support for WebWork should officially be part of someone's job description. Currently it makes most sense for that to be the Lab co-ordinator that has been building and maintaining the WebWork server to date. We will continue to advocate for the resources to incorporate this in someone's workload. Should the use of WebWork extend to other Departments, we agree that the funding for this role should be shared.

Dean of the Faculty of Science: As with many such recommendations, it comes down to available resources, which at present are very tight. I agree with the Department that this work should remain with it, and specifically the Lab Co-ordinator to manage with it remains there.

Recommendation #13: The creation of an Associate Chair in Math and Statistics would reduce the workload of the Chair. This role may also take some of the administrative work that will result from offering courses at the different campuses.

Unit Response: We agree with this recommendation and fully support the creation of an Associate Chair in Mathematics. We strongly feel the department's activities are of sufficient scope and complexity to warrant an Associate Chair. Not only would this position reduce the workload of the Chair, but it would also provide a natural opportunity for Departmental leadership succession planning. The demands on the Department Chair have only increased with the expansion of programming to the Milton and Brantford campuses.

Dean of the Faculty of Science: I recognize this issue but, again, it comes the lack of available resources. There is no doubt managing the Department takes effort, as reflected by the accommodations provided in the Collective Agreement with WLUF. Unfortunately though, context is important and there are other departments within the Faculty that are, in fact, busier, with respect to undergraduate and graduate student numbers as well as staff and faculty complements; they would need to be addressed first before the Department of Mathematics.

Recommendation #14: It would be very useful if the Faculty for Graduate and Postdoctoral Studies would develop clear documentation for faculty/staff/programs related to the admissions process, typical student requests and progression through the program.

Unit Response: The recommendation seems quite comprehensive in nature. Our Graduate Officer and Graduate Admin will discuss this recommendation with our Faculty of Graduate and Postdoctoral Studies to see what additional documentation would be most helpful/useful. It seems much of the responsibility for this recommendation resides with FGPS.

Dean of the Faculty of Graduate and Postdoctoral Studies: I appreciate the recommendation. As noted above in response to Recommendation #6 during the past two years, the FGPS leadership group and staff have provided a suite of training sessions for administrative assistants and graduate coordinators, including in the areas of admissions and academic progression. The PowerPoint slide decks that we have prepared for our Graduate Coordinator onboarding session and subsequent monthly roundtable sessions have been designed to serve as digital handbook material. Additional resources have been made available by our staff to assist with admissions (see our SharePoint site) and we actively update our webpage content. Please do not hesitate to reach out to us if there is additional documentation that you feel is needed, or an additional monthly roundtable topic of discussion that you would like us to facilitate.

Recommendation #15: Continue moving some of the undergraduate student advising and registration to the Faculty of Science. A review of the new processes should be done once they are complete to ensure that they are working effectively.

Unit Response: We agree with this recommendation. Our Undergraduate Officer and Admin will work with the Faculty of Science Advising Office and the Dean's office to continue refining the tasks of undergraduate student advising and registration. Additionally, it is incumbent on the Dean's office to review the new processes to ensure they are working effectively.

Dean of the Faculty of Science: This action is indeed being taken by the Dean's Office.

Recommendation #16: Determine how to extend the resources available at the MaSt to students attending the Milton and Brantford campuses. As processes are developed for the other campuses, documentation should be developed for future administrators.

Unit Response: As noted in our response to Recommendation #8, responsibility for the MaSt resides within Teaching and Learning. The MaSt has been active and available to students at the Brantford campus for a number of years. We will confirm with Teaching and Learning that there is a plan in place for students at the Milton campus to access this valuable resource.

Dean of the Faculty of Science: I too will seek to confirm that such is in place, and work to provide it if not.

Recommendation #17: The department should renew its attempts to hire a black/Indigenous scholar, both to enhance its efforts to build EDI within the department as well as to increase its overall level of resources and thus to help with graduate supervision and teaching responsibilities.

Unit Response: We agree with this recommendation and will continue to pursue hiring a black/Indigenous scholar, along with other avenues for increasing our faculty complement and other resources. We made an attempt when the university was hiring a group of black/indigenous scholars and submitted a proposal which was not accepted. Increased capacity for graduate supervision is needed to help facilitate continued graduate program growth.

Dean of the Faculty of Science: Again, resources are limited, and the Department's application for such an opportunity was not approved. At this juncture, it remains with the Department to recognize the issue with their next few faculty searches.

Recommendation #18: The process of advising for the double degree students should be re-evaluated, and it should be determined whether a collaborative effort with the Lazaridis School's Undergraduate Programs Office would be possible to develop a single point of contact for all advising for double degree students.

Unit Response: We will discuss with the Lazaridis School and with Faculty of Science Advising to see if a single point of contact for advising the double degree students is feasible.

Dean of the Faculty of Science: I will ensure that a review of this issue of shared/collaborative advising is conducted.

Recommendation #19: A faculty member with strong industry connections should be assigned to liaise with the co-op office and work on advertising the double degree students to potential co-op employers, with an emphasis on co-op placements that leverage the technical and quantitative skills that the students are learning in their programs.

Unit Response: This is a useful suggestion and the faculty members most involved with the double degree students will meet to discuss the feasibility of this recommendation. It seems that this recommendation may relate to Recommendation #10 that calls for the creation of the Financial Mathematics Advisory Board. One role of the Advisory Board will be to promote both co-op and post-graduation employment placements for double degree students.

Dean of the Faculty of Science: I support the Department's planned action to address this recommendation.

Recommendation #20: The department should work to enhance its presence on social media, for example creating LinkedIn groups for alumni of the department or of certain programs, and facilitating communication between graduates, current students, and potential applicants to its programs. Consider also organizing networking events to facilitate communication between these groups.

Unit Response: We agree that having a stronger presence on social media would enhance the exposure of the department, its programs, and facilitate relationships. In an upcoming Department meeting we will discuss this issue and hope there is a volunteer willing to serve as the Department's social media champion. Additionally, we will liaise with the alumni office to see if they can provide additional support for both the social media presence and in planning/funding networking events. About 10 years ago, we organized a panel with several graduates from our programs. It was a great networking event for financial math students. It is time to have another event like that one.

Dean of the Faculty of Science: Such initiatives are relatively easy to launch, but their constant maintenance (which is essential for success/usefulness) becomes problematic without sufficient resourcing that is currently not available. Nonetheless, I support the Department exploring opportunities.

Dean of the Faculty of Graduate and Postdoctoral Studies: I agree with the comments provided by the Dean of Science, but hopefully the necessary champions can be identified within the department. I recall a similar alumni panel event years ago in my home department, Geography and Environmental Studies, and it was very successful. Your students (and faculty) will no doubt appreciate opportunity to connect with alumni.

Recommendation #21: Have a faculty member or academic advisor visit early in the year in 2nd year classes to inform students about the possibility of pursuing concentrations, and late in the year in 1st year classes to let students know about the double degree programs and the possibility of transferring into them (along with providing information about admission requirements).

Unit Response: We agree with this recommendation and the Department's leadership team shall discuss how best to communicate and advertise the concentrations to our students. A clarification is that there is no formal admission/transfer process for the concentrations; students elect concentrations as part of their program and fulfill the concentration requirements by successfully completing a set of courses. Students can declare a concentration anytime prior to applying to graduate.

Dean of the Faculty of Science: This is an excellent and very helpful recommendation and I fully support the Department's planned action to address it.

Recommendation #22: Monitor the progress of the PhD students to see if the high rate of attrition experienced in the first two years of the program continues, (it is very likely that this high rate of attrition was primarily due to Covid restrictions). Since the program is so new, we suggest holding exit interviews with PhD students who leave the program, either withdrawing or graduating.

Unit Response: Progression of PhD students is monitored annually through the PhD Progress and Activity Report that is submitted in April of each year. As the program matures, data will be available to compare

attrition rates with historical norms, as with our other established programs. The suggestion of conducting exit interviews with PhD students will be considered by the Graduate Officer.

Dean of the Faculty of Science: This issue of exit interviews has arisen from different quarters of the University, and perhaps this is something that the Office of the FGPS could investigate for a centralized process.

Dean of the Faculty of Graduate and Postdoctoral Studies: The Unit is correct – the PhD Progress and Activity Report is an excellent tool to monitor academic progress. A message to pass along to faculty members is that if they sense that their PhD student is struggling to make progress, then it is really in the best interests of both the student and advisor that ‘With some concerns (first instance)’ is indicated on the form. This is not meant to be punitive – rather, this will trigger a 6-month Action Plan with deadlines for deliverables that is aimed to get the student back on track. Furthermore, advisors do not need to wait until the annual process is initiated by the student in April. Advisors can initiate completion of the PhD Progress and Activity Report at any time during the year.

Recommendation #23: Ensure that incoming students, particularly international students, are clearly informed about the cost of living in Waterloo and the limitations on University funding. The department should also offer an orientation for incoming international students very early in the term where expectations are clearly detailed and there should be a follow up contact a month into term.

Unit Response: We agree that all incoming students should be clearly informed about the full cost of attending their graduate program, including the cost of living and the level of funding promised by the university. Our Graduate Officer and Graduate Admin will discuss this issue with the Faculty of Graduate and Postdoctoral Studies. The Department typically has an orientation session in early September for all incoming Graduate Students, including international ones, that clearly defines expectations. Scheduling a follow-up meeting a month into the term is something that the Graduate Officer will consider. This follow-up meeting could also be part of a graduate student social event.

Dean of the Faculty of Science: A webpage entitled “Coming to Laurier” does exist but it does not appear to present information on actual living costs as provided in the “Cost of Living as a Laurier Student” that is directed at prospective undergraduate student.

Dean of the Faculty of Graduate and Postdoctoral Studies: All graduate students, including domestic and international, that receive funding are informed of this at time of offer. There are several Region of Waterloo and City of Brantford resources available on the ‘Coming to Laurier’ website (e.g., housing) that are aimed to aid in the transition to life in our Laurier communities. Note also that a series of pre-arrival and orientation programming has been developed for incoming graduate students (see: <https://students.wlu.ca/academics/graduate-and-postdoctoral-studies/aspire/incoming-student-support.html>).

Recommendation #24: The department should institute a procedure to monitor and evaluate carefully the impacts of the changes to the undergraduate programs in financial mathematics and the introduction of the BScMDA. In this process, particular attention should be paid to the mathematical capabilities of graduates and

the impact of the program changes and the department's ability to offer a degree suitable for students interested in pure mathematics, and to prepare students for graduate studies in mathematics.

Unit Response: We agree that assessing the impact of curriculum changes is important. We will continue to monitor progression and attrition rates with the usual indicators, including those for the newly-introduced BSc MDA program. The Department will discuss the feasibility and potential use of any additional information (e.g., advisor feedback) other than the usual indicators to assess the impact of the curriculum changes. Additionally, at an upcoming Department meeting, the Department plans to discuss the latter part of this recommendation.

Dean of the Faculty of Science: The Department has responded appropriately to this recommendation.

PROGRAM STRENGTHS

Dean of the Faculty of Science: The Department of Mathematics is heavily engaged in delivering innovative and collaborative programming at both the undergraduate and graduate levels that address real-world issues with a unique blend of pure and applied mathematics. In addition to BSc and BAs in both Mathematics and Financial Mathematics, they provide both combined and double degree programs. These efforts are offered by a complement of committed faculty members dedicated to high-quality teaching and informed by the active research programs. Examples of such commitments at the undergraduate and graduate levels include their maintenance of the Mathematics Resource Centre and the continued support of the MS2 Discovery Research Centre, respectively.

Dean of the Faculty of Graduate and Postdoctoral Studies: The department's strengths are founded on its research-active faculty in both pure and applied mathematics. I commend the program for its commitment to offer various systems of study at the MSc level with flexibility to specialize in six fields of concentration, and a well-designed PhD program with a focus on students engaging in research early in their studies and its interdisciplinary and applied research opportunities.

OPPORTUNITIES FOR IMPROVEMENT AND ENHANCEMENT

Dean of the Faculty of Science: The Department has recently launched a doctoral program, which will take their time and effort to ensure success. Also, they will have to manage the expansion of service teaching as programming they support is now being offered in both Brantford and Milton. All of this (relatively) new activity may provide the impetus to consider alternative modes of delivery as Laurier develops these opportunities.

Dean of the Faculty of Graduate and Postdoctoral Studies: Given resource constraints, the department might want to reflect on the Master's program and all that it is trying to achieve (i.e. multiple streams: thesis option, project option, course-based option and the 6 concentrations). As noted above, I give the program credit in catering to all types of Math students with wide-ranging interests at the Master's level, but the department might want to consider if this is feasible/sustainable and even desirable for the program over the next number of years.

SIGNATURES

Dr. Heidi Northwood

November 9, 2024



APPROVAL DATES

Approved by Program Review Sub-Committee: November 20, 2024

Approved by Senate Academic Planning Committee: January 9, 2025

Submitted to Senate (for information): March 4, 2025

Implementation Report Due Date: March 4, 2027

RECOMMENDATIONS PRIORITIZED FOR IMPLEMENTATION AND ACTION PLAN

The following Implementation Plan was created by the Dean of Science and the Associate Vice-President and Dean of the Faculty of Graduate and Postdoctoral Studies as part of the Decanal Response.

Recommendation to be Implemented	Responsibility for Implementation	Responsibility for Resourcing (if applicable)	Anticipated Completion Date
<p>Recommendation #1: Consider assigning a faculty member to be responsible to learn about current trends in Indigenization efforts in math and statistics across Canada. This person can be a liaison and bring information about Indigenization to the department.</p>	<p>Department With help from Office of Indigenous Initiatives</p>	<p>n/a</p>	<p>Ongoing</p>
<p>Recommendation #2: Investigate the feasibility of developing an applied math or statistics class in which the applications are focused on issues of particular interest to Indigenous peoples, such as water quality and management, managing forest fires, mathematics of climate change or climate risk in finance and insurance. A starting point might be to add examples and problems of particular interest to Indigenous peoples to existing classes. There is funding under the collective agreement for EDI, perhaps this could be used here, this could also be the responsibility of the Indigenous lead.</p>	<p>Department With help from Office of Indigenous Initiatives</p>	<p>Faculty of Science/Provost</p>	<p>Ongoing</p>
<p>Recommendation #3: Organize social events, perhaps paired with seminars or other learning events, with the department to build the community. This is needed especially to strengthen the department's community after the covid restrictions. It might be useful if the event takes the form of peer mentoring in the double-degree program and the data science program (although this cannot be too much work for the senior</p>	<p>Department</p>	<p>n/a</p>	<p>Ongoing</p>

students). We heard that there is some unused money for social events. Maybe a mentoring event with food would be an effective way to build community and have senior students advise and support junior students.			
Recommendation #4: Consider adding an optional co-op to the MSc program in the non-thesis routes.	Department Co-Op Office	Faculty of Science/Provost	Ongoing
Recommendation #5: Re-start the process to create curriculum mappings that was postponed due to the covid pandemic.	Department	n/a	August 2025
Recommendation #6: The admissions process for the PhD program should be reviewed. Further support should be provided to ensure that international grades are being evaluated properly in the admissions process.	Department FGPS Faculty of Science	Faculty of Science/Provost	August 2025
Recommendation #7: The initiation of efforts to track undergraduate student performance and link them to the admissions decision (entrance average, high school from which they graduated) should be considered.	Department Office of Student Recruitment and Admissions Faculty of Science	n/a	August 2025
Recommendation #8: As much as possible given resource constraints, expand the scope of the courses covered by the MaSt. This is a very valuable resource to	Department	n/a	Ongoing

WLU students, which appears to be well-utilized by students in the 100 and 200 level courses.			
Recommendation #9: Determine how high school students learn about the department's program and revise information sources (such as the department website) to include more information, particularly directed towards high school students, regarding the curriculum of the financial mathematics programs.	Department Office of Student Recruitment and Admissions	n/a	Ongoing
Recommendation #10: Create the Financial Mathematics Advisory Board, ensuring that this board has strong representation from industry.	Department	n/a	August 2025
Recommendation #11: Continue subscribing to the auto-grading program Gradescope. Explore possibilities for the university to provide permanent funding for this tool and to promote this tool across the university.	Department	Faculty of Science/Provost	Ongoing
Recommendation #12: Ensure support for WebWork. There is a server for WebWork that is currently maintained by one of the lab instructors---this is not officially part of their job description. Maintaining this server requires time and expertise, this could be managed through Information and Communication Technologies, or be made a recognized responsibility of a Lab Coordinator. Funding for this position might be joint between the different department that use WebWork, as other departments start to use it.	Department	Faculty of Science/Provost	Ongoing
Recommendation #13: The creation of an Associate Chair in Math and Statistics would reduce the	n/a	n/a	n/a

workload of the Chair. This role may also take some of the administrative work that will result from offering courses at the different campuses.			
Recommendation #14: It would be very useful if the Faculty for Graduate and Postdoctoral Studies would develop clear documentation for faculty/staff/programs related to the admissions process, typical student requests and progression through the program.	Department	n/a	Ongoing
Recommendation #15: Continue moving some of the undergraduate student advising and registration to the Faculty of Science. A review of the new processes should be done once they are complete to ensure that they are working effectively.	Department Faculty of Science	Faculty of Science/Provost	Ongoing
Recommendation #16: Determine how to extend the resources available at the MaSt to students attending the Milton and Brantford campuses. As processes are developed for the other campuses, documentation should be developed for future administrators.	Department Faculty of Science	Faculty of Science/Provost	Ongoing
Recommendation #17: The department should renew its attempts to hire a black/Indigenous scholar, both to enhance its efforts to build EDI within the department as well as to increase its overall level of resources and thus to help with graduate supervision and teaching responsibilities.	Department	n/a	ongoing
Recommendation #18: The process of advising for the double degree students should be re-evaluated, and it	Department	n/a	Ongoing

<p>should be determined whether a collaborative effort with the Lazaridis School's Undergraduate Programs Office would be possible to develop a single point of contact for all advising for double degree students.</p>	<p>Faculty of Science/LSBE</p>		
<p>Recommendation #19: A faculty member with strong industry connections should be assigned to liaise with the co-op office and work on advertising the double degree students to potential co-op employers, with an emphasis on co-op placements that leverage the technical and quantitative skills that the students are learning in their programs.</p>	<p>Department</p>	<p>n/a</p>	<p>ongoing</p>
<p>Recommendation #20: The department should work to enhance its presence on social media, for example creating LinkedIn groups for alumni of the department or of certain programs, and facilitating communication between graduates, current students, and potential applicants to its programs. Consider also organizing networking events to facilitate communication between these groups.</p>	<p>Department</p>	<p>n/a</p>	<p>Ongoing</p>
<p>Recommendation #21: Have a faculty member or academic advisor visit early in the year in 2nd year classes to inform students about the possibility of pursuing concentrations, and late in the year in 1st year classes to let students know about the double degree programs and the possibility of transferring into them (along with providing information about admission requirements).</p>	<p>Department</p>	<p>n/a</p>	<p>Ongoing</p>

<p>Recommendation #22: Monitor the progress of the PhD students to see if the high rate of attrition experienced in the first two years of the program continues, (it is very likely that this high rate of attrition was primarily due to Covid restrictions). Since the program is so new, we suggest holding exit interviews with PhD students who leave the program, either withdrawing or graduating.</p>	<p>Department</p>	<p>n/a</p>	<p>Ongoing</p>
<p>Recommendation #23: Ensure that incoming students, particularly international students, are clearly informed about the cost of living in Waterloo and the limitations on University funding. The department should also offer an orientation for incoming international students very early in the term where expectations are clearly detailed and there should be a follow up contact a month into term.</p>	<p>Department FGPS</p>	<p>n/a</p>	<p>Ongoing</p>
<p>Recommendation #24: The department should institute a procedure to monitor and evaluate carefully the impacts of the changes to the undergraduate programs in financial mathematics and the introduction of the BScMDA. In this process, particular attention should be paid to the mathematical capabilities of graduates and the impact of the program changes and the department's ability to offer a degree suitable for students interested in pure mathematics, and to prepare students for graduate studies in mathematics.</p>	<p>Department</p>	<p>n/a</p>	<p>Ongoing</p>