Office of the Provost & Vice President Academic
Nipissing University
100 College Drive, Box 5002

FINAL ASSESSMENT REPORT AND IMPLEMENTATION PLAN

PROGRAM UNDER REVIEW

PROGRAM	SENATE APPROVAL	PREPARED BY
Mathematics	November 8, 2024	Provost and Vice-President

A. SUMMARY OF REVIEW PROCESS & LISTING OF PROGRAMS UNDER REVIEW

SELF-STUDY REVIEW TIMELINE	DATE
1. Self-Study Presented to AQAPC	September 25, 2023
2. Site Visit Conducted	March 25, 27 & 28, 2024
3. Reviewer's Report Received	May 28, 2024
4. Internal Reviewers Response Received	September 9, 2024
5. Dean's Response Received	September 25, 2024

The members of the review committee were:

- **Dr. Tatyana Barron, University of Western Ontario**
- **Dr. Marta Kobiela, McGill University**

The academic programs offered by the Department which were examined as part of the review included:

- Bachelor of Science, Mathematics
- Bachelor of Arts, Mathematics

This review was conducted under the terms and conditions of the IQAP re-ratified by the Quality Council on January 30, 2023 and approved by Senate on June 26, 2023.

B. PROGRAM STRENGTHS

The Mathematics program objectives are in perfect alignment with the university mission and academic plan. These objectives include the highest academic standards coupled with paying careful attention to all aspects of the student experience. They are intertwined with supporting the northern communities and Indigenous learners, as well as with making decisions guided by transparency, respect, equity, diversity and inclusion.

C. OPPORTUNTIES FOR IMPROVEMENT AND ENHANCEMENT

NOTE: RECOMMENDATIONS AND COMMENTS ARE AS RECEIVED.

External Reviewers Recommendation #1: Increase participation and effort towards recruitment, particularly in the applied mathematics stream. Specific actions may include resuming and implementing outreach efforts (e.g., Math Circles), connecting with math teachers alumni, visiting area high schools, and advertising the concentration streams (and possible job options) to prospective and first year students much earlier. As requested by the math department in their Self Study Report, we also provide additional ideas for outreach activities

Unit's Response: We appreciate the reviewers' extensive ideas and suggestions for outreach activities. Many of them are things we have explored in the past, and we are inspired to renew our efforts on them. We have already engaged our undergraduate students to solicit volunteers for Math Circles for the upcoming academic year, and have also contacted the Nipissing Teaching Hub for more support. We have also reached out to two of our close contacts within the North Bay high school system, John Burns and Carmelina McParland (our former student), who brought some of their students to campus shortly before the summer for a math enrichment talk we prepared, to organize some new events to engage their students. As for the more ambitious suggestions, we plan to include discussions of ideas for how we may participate in summer camps, etc., in our regular conversations with our colleagues in education (see recommendation 2)

Dean's Response: I agree with this recommendation. The implementation of the Strategic Enrollment Management Plan and of Project Integrate will bring a number of opportunities to the faculty members of the Mathematics program for participation in recruitment. This will include more extensive collaboration between faculty members and the recruitment team in the Office of the Registrar and the better promotion of initiatives such as the Math Circles already underway in the Department. The Dean commits to facilitating these relationships in the future.

Provost's Response: I appreciate the recommendation from the reviewers. The Dean has proposed to facilitate this recommendation. Ideally, a document plan will be produced by January 31, 2025 with dates for activities and measurables so that we have identify targets for participation in recruitment programming with measurable impact on enrollment starts (and potentially retention and persistence gains). Such a plan would be annually reviewed with participation from Centre for Teaching and Learning (which supports camps), marketing and recruitment.

External Reviewers Recommendation #2: To continue collaborations with the Education department, organize a joint seminar between Mathematics/Computer Science and Education, open to faculty and students (or possibly revitalize the activities under the Numeric umbrella). In addition to regular joint discussions on education, communicate with Education privately, to sustain the collaborative approach in training future school teachers. The department (if allowed by the university and union regulations) may consider involving the two mathematics education faculty members as research mentors for the Senior Project courses for those students who may wish to pursue a research project in mathematics education. This would allow for more students to take a senior project course (provide additional experiential learning opportunities) and provide greater options (which helps with accessibility).

Unit's Response: Our weekly departmental seminar is open to all students and faculty who are interested in attending, and in the call for talks we explicitly mention that talks about math education are welcome, in addition to expository talks for students and general audience. That said, we could do more to engage our colleagues in education, and perhaps our departmental seminar is not presently serving well as a venue for that. We appreciate the suggestions of the reviewers, and will reach out to initiate some regular conversations over coffee, as a starting point for increasing our collaboration. We will also explore the idea of math education faculty serving as (co)supervisors on some our senior research project courses, which has not been done in recent years.

Dean's Response: I agree with this recommendation. Closer relationships between Education and Arts & Science programs with clear links to it can only benefit both degrees. Action #17 of the current Academic and Operational Plan

addresses explicitly collaboration between the School of Education and the Faculty of Arts & Science and commits to developing better communication structures. The Dean's Office is committed to facilitating a thorough consultation between Education faculty members and members of the Mathematics program regarding the required training in mathematical education both for general Education students and those focused on Mathematics. Increased co-operation in the departmental seminar and in the co-supervision of Senior Project courses may be a strong basis for the collaboration we seek between the Faculties.

Provost's Response: I am delighted that APOP Action #17 is being actioned through this recommendation. It would be important to establish a cross-faculty working group which may be supported by a student club to ensure activities on math education are ongoing and connected to all stakeholder groups. Again, a documented plan for annual activities would inform the University master calendar. Ideally, such a calendar would be prepared by August 20 of every year to ensure maximum notice, advertising and participation.

External Reviewers Recommendation #3: Hold a meeting between Mathematics and the NU Office of Indigenous Initiatives. Objective: discuss and strengthen continued indigenization strategy synchronised with the current university academic plan. This may include ways to bring Indigenous ways of knowing and doing into more traditional mathematics classes. Timeline: next 12 months. Format: a Mathematics and Computer Science faculty meeting with an Indigenous Office representative in attendance.

Unit's Response: We have reached out to the office of Indigenous Initiatives as suggested to organize a meeting. We will be prepared to discuss our course MATH 2326 Anishinaabek Way of Life and Mathematics with Applications, and exchange ideas for how to incorporate Indigenous ways of knowing into other established courses in our curriculum.

Dean's Response: I agree with this recommendation. The Dean's Office is prepared to facilitate these meetings and support them. Efforts such as these should be coordinated with faculty- and institution-wide attempts to Indigenize the curriculum. An Indigenous Reconciliation Targeted Action Plan is currently being developed and an Indigenous academic advisory council will be established under the current Academic and Operational Plan. Initiatives within Mathematics will gain support from these.

Provost's Response: I echo the Dean's encouragement for ongoing collaboration between OII and Math/CS. I also encourage collaboration with the Indigenous Studies program within A&S and ITEP in EPS.

External Reviewers Recommendation #4: Consider making the Data Science program more interdisciplinary, how it will evolve in connection with the university vision and in response with the provincial economic and industrial demands. Seek input from the academic leaders and bring it to the unit for discussion. A new hire in this area could facilitate the implementation of the program and be an opportunity for greater gender diversity.

Unit's Response: With the ubiquity of AI technology (e.g. generative models) in the mainstream presently, we anticipate a continuous stream of opportunities for collaboration with other disciplines within the university and community involving data science. To date, faculty and students within our data science group have undertaken projects in natural language processing and analysis of survey responses, complexity of service, and analysis of hyperspectral images. Our biggest challenge with that program remains recruitment, and we will continue to engage with our administration to seek ways to improve this.

Dean's Response: I agree with this recommendation. The Data Science program at Nipissing University is in need of a significant overhaul. It is not in step with provincial and national comparator programs in terms of its math requirements and its interdisciplinarity, as the reviewers point out. There is an appetite to invest in the program, but dramatic changes will need to precede this investment. Recruitment is a challenge, but students can only be recruited into a program that will give them the skills they need in the contemporary context. An important step in increasing the interdisciplinarity of the Data Science program will be to develop an Interdisciplinary Steering Committee to administer the program instead of the present structure in which the program is administered solely in the

MATH/COSC department and by the Chair of that department. The Dean is committed to revising the program in light of the importance of interdisciplinarity and the recommendation of the External Reviewers.

Provost's Response: I accept the recommendation of the external reviewers and commit to supporting the Dean redesign Data Science in light of its need to be interdisciplinary and reflect the nature of competitor programs across the country. Data Science should reflect distinct differences from Math (i.e, it is not a specialization in Math, but rather a distinct discipline which has the potential to attract students interested in qualitative and quantitive methods of defining problems across disciplines). Redesigning Data Science is a high priority for the University to reflect the need for STEM graduates with interdisciplinary expertise/curiosity. If the redesign requires a major modification and an LOI, I expect to receive it by February 2025, if not sooner.

External Reviewers Recommendation #5: Continue and extend current efforts related to experiential learning, particularly in years 1-3.

Unit's Response: We appreciate the thoughtful suggestions for how to incorporate more experiential learning in our courses. We have added an agenda item for our next department meeting to discuss the implementation. We agree with the comments about the senior research project courses and resources. Indeed, while we believe we are able to offer a lot of value for our students in these courses, in some years when demand for these courses is high, our faculty resources and seminar scheduling become strained, and the quality suffers. We will, in conversation with the dean's office, look into the possibility of establishing a threshold for enrollment beyond which we convert the course to one with a faculty member assigned to coordinate, as part of their workload.

Dean's Response: I support this recommendation. The support of experiential learning is a priority for Nipissing University, in all programs. Action #15 of the current Academic and Operational Plan commits the University to reviewing and streamlining its processes for developing experiential learning and supporting initiatives in this area adequately. The Mathematics program, with the support of the Dean, will be a central part of this expansion of Nipissing's capacity for experiential learning.

Provost's Response: I accept the recommendation of the external reviewers. I ask that Math/CS map (chronicle) the experiential learning opportunities that are used in the program and that they work with Denyse Lafrance-Horning on such a map, as Denyse is supporting the Provost's Office as an expert in WIL. Such a map should be shared with recruitment and marketing in order to be able to better define the distinct features of the Math/CS programs at Nipissing. I am not setting a date, but suggest that Math/CS set a reasonable date by which such actitivies are mapped.

External Reviewers Recommendation #6: Extend current efforts to provide support and community to increase retention within the program and address the lower program completion rates. Based on our assessment of the problems in Section 3

Unit's Response: We strongly agree that a dedicated space for our students would be highly beneficial for our program. Students could use a lounge to gather, build community, and help each other with courses. Our student club needs space for meetings and could hold social events there. It would also help with outreach activities to have a room with math imagery and math-related manipulatives and games readily available, inviting students and other guests to engage. With such a space, our Math Drop-in Centre could run on a regular, predictable schedule, making it more accessible to students seeking help, and faculty office hours could be held there also as needed. It would be very helpful to have such a space for impromptu, informal discussions with students and faculty about courses, and about research -- presently we often make use of a blackboard in a cramped hallway outside of our offices. We frequently have research visitors on campus, for both short- and long-term visits, and it would be great to have dedicated visitor office space to offer them. If large enough, such a space could also hold our departmental seminars, and some of our lectures (particularly in our smaller, upper-level courses).
- We are intrigued by the idea of formalizing tutorials for some of our third-year courses, where students transition to some fully proof-oriented courses. In recent years, faculty have been holding extra office hour/tutorial sessions for theses students, and the attendance has been strong and feedback positive. Having more teaching assistant funds available to run a formal tutorial session would be very helpful. We appreciate the numerous thoughtful suggestions of ways to help students succeed in reading and writing proofs, and look forward to implementing many of them in our

upcoming courses.
- In our first-year calculus course MATH 1036, whose prerequisite material is most stringent among all of our entry-level program courses, we have been devoting some class time and one homework set at the beginning of the semester to review material from high-school, at the expense of some portion of the topics at the end of the course, namely curve sketching and optimization. We will engage with our students to determine whether and how to expand on this review to help students feel more prepared for our math courses. Additionally, we will consider moving a topic, e.g. optimization, into the sequel course MATH 1037.

Dean's Response: There are a number of useful recommendations for strategies encouraging retention in the Appendix to the External Reviewers' Report. Space is at a premium in the Education Centre Building which makes it difficult to dedicate tutorial and lounge space to the students of a single program, not to mention dedicated office space large enough to hold lectures and seminars for the visitors to a single program. It is likely that such dedicated space often would be unused. Presently, students and faculty members can book space in the library and on campus for tutorials or social events. I would encourage the program members to take advantage of this.

The Dean currently receives applications for tutorial assistance and distributes teaching assistants according to the needs of our programs and the constraints of the budget. The Mathematics program receives over half of the Arts & Science teaching assistant budget for the tutorials it currently offers. Any new proposals for funds will be assessed with all of the proposals for Arts & Science.

I encourage the Mathematics program to reach out to the Director of Teaching and Learning when assessing the progression of students through the program. A curriculum map can be an invaluable tool in planning the acquisition of skills and the progression of students through a course of study. The Centre for Teaching and Learning can support the Mathematics program in developing such a map.

Provost's Response: On the question of how to best use tutorial/lab as well as extracurricular support and how to address progression (retention and succss), like the Dean, I encourage Math/CS to meet with the Director of Teaching and Learning to disambiguate the issues and work to a comprehensive plan—as I anticipate that the issues may be multipronged and require multiple solutions. Those solutions also need to be assessed over time, so that a plan in place would allow us to keep focus and measure success. A plan developed in concert with the Director of Teaching and Learning should be completed by November 1, 2024 if there are to be any changes to be delivery of courses (labs, tutorials, course changes) and by April 30, 2025 if such changes can't be agreed in time to affect the 2025-26 course master.

External Reviewers Recommendation #7: Continue and extend current assessments and teaching aimed at targeting the following program-level outcomes: knowledge of methodologies, application of knowledge, communication skills (particularly oral skills), awareness and limits of knowledge, and autonomy and professional capacity.

Unit's Response: As with other recommendations, we appreciate the thorough suggestions for learning and assessment activities. Presentations are already an integral component or have been used recently in our senior research project courses MATH 4496 & 4497, MATH 4246 Optimization, MATH 3296 Mathematical Modeling, MATH 3137 Real Analysis II, MATH 2306 History of Mathematics, and our course for education students MATH 1070 Fundamental Concepts of Mathematics for Teachers, among others. We will endeavor to expand on the inclusion of such elements in other courses as well, as time permits. Good candidates may include our algebra courses MATH 3156 & MATH 3157, MATH 3166 Topology, and MATH 3136 Real Analysis I, where proofs are heavily featured.

Dean's Response: Again, I encourage the faculty members of the Mathematics program to access the resources of the Centre for Teaching and Learning when determining whether current assessments adequately evaluate the learning objectives of the courses in the program.

Provost's Response: This recommendation will be supported by the Director of Teaching and Learning. A revised curricular map will help to demonstrate where program level outcomes are being met and what gaps continue to present themselves in the curriculum. The dates attached to recommendation #6 pertain here.

D. IMPLEMENTATION PLAN

Below are the recommendations that require specific action as a result of the Review, along with the identification of the position or unit responsible for the action in question. Notwithstanding the position or unit identified as the being responsible for specific recommendations, the Dean of the Faculty has the overall responsibility for ensuring that the recommended actions are undertaken

RECOMMENDATION	RESPONSIBLE MEMBER/UNIT	PROJECTED COMPLETION
Recommendation #1: document outreach activities with dates and measures	Math/CS and Dean	January 31, 2025
Recommendation #4: Data Science redesign	Dr. Mark Wachowiak, Dean with Manager, QA and PI	February 15, 2025 or sooner
Recommendation #6, 7, 5: Program outcomes assessment and, as a subset of that, WIL	Math/CS, Dr. Kari Rasmussen and Denyse LaFrance-Horning	November 1, 2024, but if not reasonable, April 30, 2025
Recommendation #2, 3: Coordinate efforts with internal colleagues in OII and SSoE	Math/CS and Deans and Director, OII	Ongoing