MATH STRATEGIC FRAMEWORK

March 2024

UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS

CONTENTS

Direct enquiries to math.planning@uwaterloo.ca

DEAN'S MESSAGE

Mathematics provides a conceptual framework to change the world. It is a quantitative infrastructure that can be applied to many of the seemingly intractable problems our world faces today. Whether we are speaking of technological, economic, societal, sustainable or health challenges, the Faculty of Mathematics is already helping to shape solutions.

Yet mathematics is not constrained by known problems or application to existing challenges. It is driven by curiosity, by the desire to create beautiful new structures at once unfettered and informed by our natural world and human experience. Its value lies in exploration and the expansion of knowledge, resulting in discoveries for which there may well be no outward application, or one that will be revealed just beyond the horizon.

The world needs mathematics. That is true across the whole range of our work, from the most applied technological and lab-based research projects to the most fundamental and theoretical explorations. It is our responsibility to create mathematical ideas and solutions, to educate experts and problem solvers, and to engage the curiosity of researchers and students of all ages.

It is in this context that I am pleased to present our new Math Strategic Framework, which will help guide our work in the coming years.

FROM PLAN TO FRAMEWORK

Typically, institutions of higher education create five-year plans. Here in the Faculty of Mathematics, we have traditionally followed that pattern. But with the pace of change today and shifting expectations and responsibilities for academic institutions, the typical five-year patterns of planning are insufficient.

We have taken an intentional step to shift from cyclical plans to a more dynamic and flexible approach: a strategic framework. By "framework," we mean to provide the same clarity of direction as in our traditional strategic planning, complemented by an annual review cycle that enables that direction to shift as necessary and adapt over time.

DRAWING ON WATERLOO AT 100

Our Math Strategic Framework draws inspiration from the new Waterloo at 100 vision. We find this vision to be aspirational and at the same time grounded in necessity and practicality. Through our planning process we identified the elements of Waterloo at 100 where Math is best positioned to make meaningful contributions while also making space to emphasize other Faculty priorities, like curiosity-driven exploration.

We also identified unique Math strengths. Some of these appear in this framework as distinct goals and others – most notably our renowned outreach work and international impact – contribute across multiple goals and objectives in an integrated fashion, reflecting the way this work broadly impacts the Faculty.

ONGOING CONSULTATIVE PROCESS

The Math Strategic Framework is the result of a highly involved consultative process. Thank you to everyone who participated in consultations and to the members of the Math Planning Forum and Math Strategic Planning Committee for their contributions.

The consultations do not stop here. Now that the Math Strategic Framework is being put into practice, we will continue to consult with employees and students in the Faculty of Mathematics, and continue to refine our strategies, goals and priorities. We see the launch of the Math Strategic Framework not as the end of a process, but as a beginning.

I am excited for this new direction we are taking as a Faculty, and the ways that our decision-making is being informed by ongoing engagement with our Faculty of Mathematics community.

MATH WITH PURPOSE

The new Math Strategic Framework foregrounds our commitments and responsibilities. It is not a checklist of things to accomplish so much as it is a process that we can use to realize our great aspirations.

As you will see, the Math Strategic Framework intersects with the grand challenges the world is facing today while affirming the need for intellectual exploration that might shape tomorrow. We are committed to mobilizing our work for positive impact, from local to global. We are committed to advancing fundamental knowledge. We are committed to equity, diversity and inclusion. And we are most of all committed to people and to ensuring a Waterloo Math community where people thrive, connect and contribute.

We believe that Waterloo Mathematics, our uniquely connected conception of mathematics, computer science, statistics and actuarial science, has a special role to play in addressing the pressing issues of today and of tomorrow. When we do math with purpose, we make a better world.

EXECUTIVE SUMMARY

The Math Strategic Framework marks a transition for the Faculty of Mathematics, from successive strategic plans on fixed cycles to a strategic framework characterized by an ongoing cycle of engagement and review.

Development of this framework was shaped by broad consultation and engagement with internal and external community members. It contextualizes the Waterloo at 100 vision and identifies unique priorities and strengths for the Faculty of Mathematics, establishing near- and medium-term objectives to advance the University, the Faculty and its disciplines.

While it serves as a guide for targeted efforts, this framework does not signal a deviation from our commitment to all areas of our mission, including those not elaborated here. It seeks to advance the Faculty broadly, through priorities that cut across areas and activities. As such, some core areas of our mission, including undergraduate studies and outreach, are represented in multiple objectives across goals and lenses rather than subject of a specific goal.

This framework will support decision-making and help inform integrated planning across the Faculty of Mathematics. Implementation will be rolling, with priorities for action considered each year. An annual consultative review will provide the flexibility to adapt to new opportunities, respond to unforeseen challenges, and shift our focus from priorities where progress has been made toward where it is still needed.

The Math Strategic Framework comprises three lenses – which describe how we will shape the environment in which our community members learn, study and work – and four goals – which describe how we will advance the Faculty of Mathematics across all areas of our mission.

LENSES

- Collaboration and Consultation
- Equity and Inclusive Communities
- Well-being and Community

GOALS

- Advance and Value Fundamental Research
- Enhance Teaching, Learning and Curriculum
- Enrich the Graduate Program
- Mobilize Research and Education for Impact

LENSES

Lenses are broad and foundational priorities for the Faculty of Mathematics that describe how we will shape the environment in which members of the Waterloo Math community learn, study and work.

We will intentionally consider our plans and decisions through these lenses and will work to advance the objectives and strategic actions identified for each lens.

Collaboration and Consultation

1. OBJECTIVE: Increase engagement and consultation with students and employees.
    - 1a. Expand employee and student interest through information sharing by Faculty and unit leaders.
    - 1b. Enable regular engagement with members of the Faculty of Mathematics community to welcome feedback and diverse perspectives.
2. OBJECTIVE: Leverage collaboration to enhance operations and improve employee experience.[1]
    - 2a. Build incentives for individuals and teams to collaborate for productivity gains.
    - 2b. Establish systemic mechanisms for employees to share experience, good practices, tools and innovations.
    - 2c. Increase employee awareness and use of the roles and offices across the Faculty and University that can support their work.
    - 2d. Seek opportunities to empower employees to engage with other units that are creating new systems or implementing new processes.

[1] See the goals “Mobilize Research and Education for Impact” and “Enhance Teaching, Learning and Curriculum” to learn how collaboration will also be leveraged in the development of students and the expansion of interdisciplinarity.

Equity and Inclusive Communities[2]

3. OBJECTIVE: Expand capacity for equity, diversity, inclusion (EDI) and Indigenization work.
    - 3a. Uphold and apply the Math Equity and Inclusive Communities Principles broadly across the Faculty.
    - 3b. Increase employee and student participation in EDI and Indigenization training.
    - 3c. Increase the use of data to better understand the composition and experiences of the Waterloo Math community and to track progress toward EDI and Indigenization goals.
    - 3d. Build advocacy, allyship and understanding of the intent and value of EDI and Indigenization work.
4. OBJECTIVE: Identify and address EDI barriers to student and employee participation.
    - 4a. Increase the availability and dissemination of scholarships for underrepresented groups, including for students whose participation is limited by economic means.
    - 4b. Review employee recruitment, retention and promotion practices to include ways of pursuing excellence and measuring merit that better support EDI.
    - 4c. Seek opportunities for more diverse student recruitment and admissions practices.
    - 4d. Focus sustained outreach to groups underrepresented in mathematics, computer science and statistics, including to Indigenous communities.

[2] This lens, and the use of the acronym "EDI" here, intend to broadly indicate advancing human rights, equity, diversity, and inclusion, including supporting accessibility, anti-racism, decolonization, gender equity, and promoting a sense of belonging for everyone.

Well-being and Community

5. OBJECTIVE: Grow the sense of community in the Faculty of Mathematics.
    - 5a. Increase student community through ongoing program development and by incorporating community-building opportunities in academic supports.
    - 5b. Facilitate employee connections within and across units and roles, beginning at onboarding.
    - 5c. Enhance alumni connections with the Faculty and each other.
    - 5d. Increase opportunities and incentives for faculty, alumni and students to interact outside the classroom.
    - 5e. Connect students and employees to the local community through projects and service opportunities.
6. OBJECTIVE: Support the well-being of students and employees.
    - 6a. Help students understand and feel comfortable accessing the full scope of well-being supports and services available to them.
    - 6b. Support students in adopting good practices that support well-being.
    - 6c. Identify and address barriers to work-life balance and other factors that negatively affect the employee experience.
    - 6d. Seek to understand and combat negative cultures that can be detrimental to well-being.

GOALS

Goals are priorities established to strategically advance the Faculty of Mathematics across all areas of our mission by unifying action and informing decisions.

To make progress toward our common goals, we will work to achieve the objectives and strategic actions identified for each goal.

Advance and Value Fundamental Research

7. OBJECTIVE: Grow research groups focused on fundamental research.
    - 7a. Encourage and support the development of structured, interconnected groups focused on fundamental research.
    - 7b. Build researcher connections around existing and emerging strengths, within and across units.
    - 7c. Engage undergraduate and graduate students in research groups.
8. OBJECTIVE: Enhance resources to support fundamental research.
    - 8a. Attract and support excellent faculty, postdoctoral fellows and graduate students conducting fundamental research.
    - 8b. Articulate opportunities to support researchers and research groups engaged in fundamental research.
9. OBJECTIVE: Highlight the value of fundamental research and scholarship.
    - 9a. Build broad appreciation of the essential value of fundamental mathematics through outreach and communications.
    - 9b. Identify fundamental research as a core strength for the Faculty of Mathematics in internal and external communications and marketing.
    - 9c. Identify and advocate for the use of discipline-sensitive measures of research impact and excellence that accurately assess fundamental research.

Enhance Teaching, Learning and Curriculum

10. OBJECTIVE: Systematically revise curriculum to reflect our changing world.
    - 10a. Encourage and facilitate regular curriculum review.
    - 10b. Employ smaller-scale refreshes to update content.
    - 10c. Consider the perspectives of students, recent graduates, domain professionals and industry partners in curriculum development.
11. OBJECTIVE: Facilitate teaching development and innovation.
    - 11a. Enhance formative teaching evaluation from peers and students.
    - 11b. Foster the adoption of evidence-based teaching approaches and educational technology that best meet students' diverse needs.
    - 11c. Incentivize, support, and reduce barriers to teaching innovation.
    - 11d. Support scholarship of teaching and learning and the use of evidence to assess the effectiveness of teaching innovations.
12. OBJECTIVE: Support the development of students as ethical, collaborative problem solvers.
    - 12a. Increase opportunities for student problem solving and collaboration through pedagogical approaches such as group learning and project-based assessments.
    - 12b. Collaborate with campus experts to develop discipline-responsive content to engage all students in ethics.
    - 12c. Nurture student accountability for learning.

Enrich the Graduate Program

13. OBJECTIVE: Attract high quality graduate students.
    - 13a. Enhance funding available for research-based graduate students.
    - 13b. Increase clarity and transparency in funding information communicated to prospective graduate students.
    - 13c. Expand professional master's programs in impactful key areas that are of interest to diverse prospective student audiences.
14. OBJECTIVE: Realize a consistently high standard of graduate student supervision.
    - 14a. Establish and monitor expectations for graduate student supervision.
    - 14b. Ensure clarity and consistency in the application and communication of graduate studies policies, procedures and decisions.
15. OBJECTIVE: Support graduate work-integrated learning and connections to industry.
    - 15a. Expand work-integrated learning opportunities that are responsive to the unique needs of graduate students, including curricular integration in professional master's programs.
    - 15b. Increase opportunities for graduate student links with industry and supports for graduate students interested in industry paths.
16. OBJECTIVE: Enhance graduate student teaching and teaching assistant experiences.
    - 16a. Encourage graduate student participation in teaching training programs provided within their units and by Faculty and University offices.
    - 16b. Expand opportunities for graduate students to lead tutorials and teach classes.
    - 16c. Identify and implement best practices across the Faculty related to teaching assistant roles, scheduling, evaluation and recognition.

Mobilize Research and Education for Impact

17. OBJECTIVE: Amplify research and education that is connected to local and global needs.
    - 17a. Identify and encourage research that addresses global challenges and contributes to the Global Futures (societal, health, sustainable, technological and economic) articulated in the Waterloo at 100 vision.
    - 17b. Increase student engagement with global issues and societal challenges.
    - 17c. Expand industry-partnered relationships with researchers and students.
18. OBJECTIVE: Foster interdisciplinary research and education.
    - 18a. Increase opportunities, incentives and space for interdisciplinary research.
    - 18b. Establish clear criteria that value interdisciplinary research for faculty recruitment, performance review and promotion.
    - 18c. Facilitate and encourage co-supervision of graduate students across disciplines.
    - 18d. Effectively support collaborative programs, options and specializations in select strategic areas.
    - 18e. Encourage students to take courses outside their disciplines of focus.
    - 18f. Foster opportunities for students in other Faculties to increase their mathematical, computational and statistical literacy.
19. OBJECTIVE: Expand innovation, social and policy engagement, and entrepreneurship.
    - 19a. Develop systems, supports and incentives to facilitate public policy engagement.
    - 19b. Increase student and employee exposure to entrepreneurship, including a focus on social innovation.
    - 19c. Incentivize and facilitate the commercialization of intellectual property and the development of fundamental research towards industrial partnership and commercialization.
20. OBJECTIVE: Expand the international reach of the Faculty of Mathematics.
    - 20a. Encourage and facilitate international research collaboration.
    - 20b. Attract top international faculty, students, postdoctoral fellows and visitors.
    - 20c. Sustain outreach and recruitment work to further diversify the international communities from which the Faculty attracts strong students.

FRAMEWORK DEVELOPMENT

The Math Strategic Framework is grounded in the perspectives and priorities of our internal and external community members. In spring and fall 2023, two consultation phases engaged employees, students, alumni and external partners in consideration of the Faculty's future. Participants in a series of workshops then reviewed consultation data to distill the Faculty's strategic priorities. Appendices C and D provide participation data and a timeline.

Phase I consultations engaged 126 students, employees, alumni and external partners in 30 guided small-group discussions. These discussions were framed around reflections on the Waterloo at 100 vision. The Math Strategic Planning Committee (MSPC) reviewed the Phase I findings report during a June workshop.

Phase II consultations presented consolidated Phase I findings in an online confidential engagement tool shared with all employees and students. We asked respondents to prioritize initial consultation findings and to identify any ideas that had been missed. Over 300 responses were submitted, including over 180 open-ended comments.

In October 2023, about two dozen students and employees (the Math Planning Forum, or MPF) joined MSPC at an all-day workshop to review and process the aggregated consultation findings. MSPC met again in November to review these workshop findings and to shape objectives and strategic actions. MSPC and MPF then reviewed and refined the initial draft framework.

The final draft was shared with Math employees and student leaders in February 2024 for feedback to refine the final framework, published in March 2024.

FRAMEWORK IMPLEMENTATION

With the Math Strategic Framework we will continue the rigorous process – established during the Strategic Plan 2018 period – to identify, assess and support pan-Faculty strategic initiatives. Furthermore, as the Faculty of Mathematics moves toward an integrated planning model, we will connect operational planning to our strategic priorities within and across units.

Implementation of the strategic framework will involve an ongoing cycle of engagement and review, with priorities for action considered each year. It will provide the flexibility to adapt to new opportunities, respond to unforeseen challenges and shift our focus from priorities where progress has been made toward where it is still needed.

APPENDIX A: MATH STRATEGIC PLANNING COMMITTEE

MEMBER	ROLE
Mark Giesbrecht	Dean, Faculty of Mathematics & MSPC Chair
Marek Stastna	Associate Dean, Computing
Lori Case	Associate Dean, Cooperative Education
Bertrand Guenin	Associate Dean, Graduate Studies
Charles Clarke	Associate Dean, Innovation & Entrepreneurship
Christiane Lemieux	Associate Dean, Operations & Academic
Anita Layton *(to June 2023)*	Associate Dean, Research
Sue Ann Campbell *(from July 2023)*	Associate Dean, Research
Troy Vasiga	Associate Dean, Undergraduate Admissions & Outreach
Benoit Charbonneau *(to June 2023)*	Associate Dean, Undergraduate Studies
Cecilia Cotton *(from July 2023)*	Associate Dean, Undergraduate Studies
Peter Wood	Assistant Dean, Online Instruction & Lifelong Learning
Siv Sivaloganathan *(to June 2023)*	Chair, Department of Applied Mathematics
Hans De Sterck *(from July 2023)*	Chair, Department of Applied Mathematics
Chaitanya Swamy	Chair, Department of Combinatorics & Optimization
David McKinnon	Chair, Department of Pure Mathematics
Changbao Wu	Chair, Department of Statistics & Actuarial Science
Raouf Boutaba	Director, Cheriton School of Computer Science
Candace Harrington *(to September 2023)*	Director, Advancement
Alexandra Lippert *(from October 2023)*	Director, Advancement
Ian VanderBurgh	Director, CEMC
Hans De Sterck *(to August 2023)*	Director, Computational Mathematics
George Labahn *(from September 2023)*	Director, Computational Mathematics
Mu Zhu	Director, Graduate Data Science Program
Ilham Akhundov	Director, Math Business & Accounting Programs
Sean Speziale	Director, Math Undergraduate Group
Stephanie Whitney	Director, Research & Innovation Partnerships
Jon Parsons	Director, Strategic Communications
Martha Foulds	Director, Strategic Initiatives
Jack Rehder	Executive Officer
Jeremy Steffler	Faculty Equity Officer
Udaya Wettasinghe	Faculty Financial Officer
Diana Skrzydlo	Teaching Fellow
Khushi Malik *(spring 2023)*	Research Analyst (co-op) & MSPC resource
Kashish Kahlon *(fall 2023)*	Research Analyst (co-op) & MSPC resource

APPENDIX B: MATH PLANNING FORUM

MEMBER[3]	ROLE
Maya Samra	Undergraduate Student, Mathematics
Lucas Tate	Undergraduate Student, Pure Mathematics
Remington Zhi	Undergraduate Student, Pure Mathematics
Oluwaseun Cardoso	Master Student, Computer Science
Madison Van Dyk	PhD Candidate, Combinatorics & Optimization
Chris Salahub	PhD Candidate, Statistics & Actuarial Science
Greg Campbell	Academic Advisor, Math Undergraduate Office
Carol Seely-Morrison	Administrative Manager, Combinatorics & Optimization
Lesley Bayne	Associate Director, Development, Faculty of Mathematics
Samantha St. Amand	Data Scientist, Faculty of Mathematics
Donna Lutz	Director, Math Undergraduate Office
Barbara Daly	Instructional Support Coordinator, Computer Science
Steve Van Doormaal	Instructional Support Coordinator, Statistics & Actuarial Science
Robyn Landers	IT Specialist - Team Lead, Math Faculty Computing Facility
Brittany Reiche	Manager, Research, Math Research Office
Daniel Reyes Huab	Undergraduate Studies Coordinator, Computer Science
Anila Yadavalli	Lecturer, Centre for Education in Mathematics & Computing
Burcu Karabina	Lecturer, Math Undergraduate Group
Chelsea Uggenti	Lecturer, Statistics & Actuarial Science
Rafael Oliveira	Assistant Professor, Computer Science
Brian Ingalls	Professor, Applied Mathematics
Ashwin Nayak	Professor, Combinatorics & Optimization
Kate Larson	Professor, Computer Science
Barbara Csima	Professor, Pure Mathematics
Paul Marriott	Professor, Statistics & Actuarial Science

[3] Although some MPF members had to miss the October workshop due to circumstances outside their control, all members had the opportunity to comment on the workshop materials and initial working draft of the strategic framework.

APPENDIX C: CONSULTATION PARTICIPATION

ENGAGEMENT	PARTICIPANTS
Total consultation inputs	431
>by undergraduate students	176
>by graduate students	52
>by faculty	78
>by staff	60
>by alumni	44
> by external partners	10
Small-group members	126
Small-group discussions	30
Consultation tool responses	305
>consultation tool qualitative comments	189
Workshop members	53

APPENDIX D: FRAMEWORK DEVELOPMENT TIMELINE

Timeframe	Activity
March 2023	MSPC Workshop to establish framework consultation and development processes
May – June 2023	Internal Small Group Consultations guided discussions with groups of students and employees
June – August 2023	External Small Group Consultations guided discussions with groups of alumni and external partners
July – September 2023	Broad Internal Community Consultation online consultation tool shared with all students and employees
October 2023	MSPC and MPF Workshop to review and consolidate all consultation findings
November 2023	MSPC Workshop to initiate organization of consolidated findings into framework content
December 2023 – January 2024	Initial Draft Review shared with MSPC and MPF members for refinement
February 2024	Final Draft Review shared with internal community for feedback
March 2024	Final Math Strategic Framework published, shared broadly and put into practice