

## Teaching Statement

My passion for teaching was sparked during my undergraduate years at McGill university, where I experienced the rewarding feeling of helping my peers navigate complex mathematical and computational concepts. From conducting review sessions for algebra courses to designing and leading an (unofficial) summer course on category theory, my early experiences reinforced my commitment to fostering both understanding and enthusiasm in students. This dedication has only grown with each new opportunity, leading me to develop a teaching approach focused on interactive learning and peer engagement.

In addition, I am deeply committed to making the world of scientific research more accessible to the general public, a goal I've pursued through extensive outreach activities aimed at younger students.

Altogether, I estimate that my teaching engagements total around 160 hours of lectures and tutorials with group sizes averaging 20, alongside approximately 140 hours dedicated to outreach for students aged 10-18.

## Teaching Experience

### At McGill University

In my first teaching role at McGill, I designed and led review sessions for large groups (50-100) of undergraduates in algebra. I compiled exercise sheets focused on recurring exam questions, created detailed solutions, and guided students through them during three-hour lectures. These sessions allowed me to experiment with structuring and presenting challenging concepts, as well as improve my blackboard planning. Based on consistent student feedback and the encouragement of the Student Society, I continued to lead these tutorials throughout my undergraduate years.

Later, as a teaching assistant for COMP330 *Theory of Computation* under Professor Prakash Panangaden, I held office hours, and I graded assignments and midterms. I obtained more experience in providing support to students in one-on-one settings, and got to closely observe how a course for large groups (100+ students) is organized.

During the summer following my graduation, I took the initiative to teach category theory to my peers. I wrote lecture notes (drawing from several books on the subject), and I conducted weekly lectures to a group of 10 students. I gained valuable experience in lecturing smaller groups, and designing course material. What stood out most from this experience was how teaching is one of the most effective learning methods for me as well. This realization continues to influence my teaching style, leading me to adopt more interactive methods that encourage student participation in all my future roles.

### At ENS de Lyon

At ENS de Lyon, I also continued teaching category theory alongside fellow master's students. We collaboratively designed the syllabus and lectures, and I wrote a homework sheet aimed at computer science students. The collaborative nature of this teaching experience, where we exchanged feedback and critiqued each other's work, greatly enhanced my ability to refine and improve my subsequent lectures.

During my PhD, I took on the role of primary organizer of the course, which led me to

shift focus from my own teaching to the growth of the new student lecturers. I watched them give mock lectures every week to give corrections and comments that they could implement before the real lecture. I gave feedback on the content, structure, and rhythm of their presentation, and I observed major improvements, even after a mere 10 weeks.

I was also a teaching assistant for master's classes in computer science. I designed exercise sheets that we would solve during weekly tutorials. Once again, in an effort to encourage students to learn by teaching, I changed the usual formula of tutorials. I would ask for students to solve and present their solutions to the class, and I monitored the discussions that succeeded. This approach created an inclusive and supportive classroom environment, where every student could engage meaningfully with the material.

## **Outreach**

My teaching philosophy extends beyond traditional classroom settings to outreach efforts aimed at making mathematics and computer science engaging for diverse audiences.

I supervised short internships for high school students aged 16-17, where I introduced them to research and guided them in exploring mathematical concepts creatively using string diagrams—a tool I study in my own research that allows complex abstract math to be visualized, making it more intuitive. I also led interactive tours and in-class activities with school groups at the Maison des Mathématiques et de l'Informatique (MMI).

I appreciated the informal and hands-on nature of these interactions with younger students. My primary goal was not necessarily to teach specific concepts but rather to make the experience enjoyable, leaving students with the impression that math and computer science can be fun. This work has been deeply fulfilling, as it aligns with my belief that everyone should have access to inspiring and relatable education.

## **Teaching philosophy**

Through both my learning and teaching experiences, I've come to believe that teaching is one of the most effective ways to learn. This concept, supported by numerous studies on pedagogy, is reflected in widely endorsed strategies such as peer teaching, flipped classrooms, and think-pair-share. These approaches have greatly influenced my teaching methods.

During the tutorials I led at ENS de Lyon, the format involved both solving problems and presenting solutions to peers. This approach was particularly effective with small groups of autonomous students for two reasons. First, while introductory exercises (such as those introducing definitions) can be solved quickly by students already comfortable with abstraction, explaining one's solution requires additional skills, such as clear communication, and a deeper understanding. Allowing students to practice teaching in a low-stakes environment enriched the learning experience. Second, finding a balance in a group of 15 students, where some progress faster than others, is challenging. By facilitating a collaborative approach to sharing solutions, I ensured that no student was left behind, regardless of the pace at which they grasped the content.

On a smaller scale, I was able to support two cohorts of two and four student lecturers when organizing an elective course on category theory at ENS de Lyon. I closely supported their initial teaching experiences by guiding them in lesson preparation and offering thorough feedback. I observed the positive impact of holding a teaching role on their understanding of the subject and their confidence.

The main reason I love teaching is that I learn so much while doing it. I try to commu-

nicate my passion for both acquiring and disseminating knowledge and understanding in all my classes. I make my students actively participate and interact with each other to boost their confidence and allow them to better recognize their abilities and their areas for improvement.

Outside the classroom, I strive to create an accessible and welcoming space for communications. For example, at ENS de Lyon, I set up a Discord server because that was the preferred platform for all students, and I held weekly office hours (an uncommon practice in France) to provide another mean of exchanging with me. I also curate lists of diverse educational resources to complement my lectures and tutorials in order to appeal to a bigger proportion of my groups.

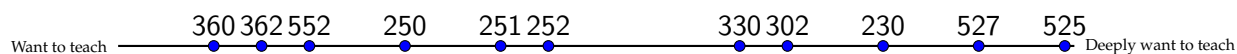
Our privileged position as academics in top institutions requires us to keep up with and go beyond the exceptional standard set by the best scientists all around the world. That is why I am always on the lookout to improve my teaching methods by learning from and sharing with my peers.

With this in mind, I got involved as a volunteer in several outreach programs aimed at younger students. The different formats and audience required me to learn new tricks. I had to design and put into action more hands-on and engaging learning activities to captivate school groups on subjects they often look down on. While these approaches are less necessary in higher education, I think they can be a great asset within a curriculum.

During a research visit at McGill University in Fall 2022, I also attended biweekly meetings on pedagogy in math education organized by Rosalie Bélanger-Rioux. Through discussions with other students, lecturers, and professors, I learned about the importance of letting students formulate their own questions, and how to effectively implement interactive learning strategies in bigger groups.

## Teaching Interests

I am passionate about teaching subjects at the intersection of mathematics and computer science, with a preference for those related to my research on semantics and logic. Below is a selection of courses (referred to by their course numbers) offered by the School that I would be excited to teach at McGill, roughly ordered according to my preferences.



I am also eager to supervise student research projects and reading courses in areas aligned with my research interests, such as quantitative aspects of program semantics, and diagrammatic reasoning.

Additionally, I envision designing and delivering *Topics* courses that introduce students to advanced subjects not currently covered in the curriculum. For example, a course on string diagrams for computer science could introduce students to new and actively researched foundations for machine learning, quantum computing, and natural language processing. Another course on category theory in computer science could initiate students to the abstract categorical language that permeates many research works in theoretical computer science and mathematics.

The considerable diversity that we find at McGill, and in all of Montréal, makes the practice of teaching there that much more rewarding. I aim to support the School's efforts to foster an inclusive environment that welcomes anyone seeking access to higher education, with particular attention to supporting those from underprivileged backgrounds.