Teaching Statement Cameron Ruether, Ph.D.

Postdoctoral Fellow	Department of Mathematics and Statistics
Email: cameronruether@gmail.com	Memorial University of Newfoundland
Website: cameron-ruether.bitbucket.io	St. John's, NL, Canada
	A1C 5S7

I center my approach to teaching around the belief that understanding in mathematics is marked by, and most effectively achieved by, developing mathematical intuition. In particular, I always teach with an example heavy style and encourage students to practice with exercises between lectures, thereby providing them with the material needed to build their intuitions. Additionally, I strongly believe that anyone is capable of building a robust mathematical intuition if given sufficient time. In order to offer students the time and resources they need to develop their intuition, I practice a policy of open flexibility and generous availability. I have developed these policies over eight years of experience comprised of teaching three university courses, one of which was online via Zoom, and six years of experience lecturing as a graduate teaching assistant. I am comfortable teaching undergraduate courses in any subject and, as an algebraist, graduate courses in algebra.

1. Teaching Experience.

• Fall 2022: MAT 1302 Mathematical Methods II and MAT 1330 Calculus for Life Sciences.

Both of these were introductory courses for non-math majors. The first, Mathematical Methods II, was a linear algebra course primarily taken by business students. The second, as is clear from the name, was aimed at students in life sciences. I was familiar with the content of these courses from my prior experience as a teaching assistant and therefore tailored my lectures to avoid overly technical proofs, which students would not have engaged with, and instead emphasize applications of the presented theory. Logistically, these courses were both offered in multiple sections during that semester and so I collaborated with other instructors to coordinate course schedules, homework assignments, and exam content. In particular, I have experience cooperatively creating exams suitable for such courses.

• Spring/Summer 2021: MAT 1341 Introduction to Linear Algebra.

This course was an introductory linear algebra class geared towards students in math and STEM. As such, it allowed me to use and refine my strengths in effectively communicating proofs to new math students and in teaching proof writing that I learned while working as a teaching assistant, in particular for the class MAT 1362 as discussed below. Since this course occurred during the summer, it was the only section offered that semester. Therefore, I independently controlled the course's pacing, homework assignments, and exams. This course also occurred during the pandemic and was conducted entirely online. While the online format has some unavoidable downsides, I believe these were minimized by my familiarity with technology and ability to incorporate digital tools into the lectures while maintaining the style of a traditional lecture.

In addition, I have six years of experience, from 2015 to 2021, lecturing in discussion groups as a teaching assistant throughout my graduate studies at the University of Ottawa. During this time, I won a "Teaching Assistant of the Year" award from the University of Ottawa in 2018. I have worked as a teaching assistant for the following courses.

- 1300 Mathematical Methods I (Calculus)
- 1302 Mathematical Methods II

• 1322 Calculus II

- \bullet 1320 Calculus I
- 1327 Intensive Calculus for Life Sciences
- 1348 Discrete Mathematics for Computing
- \bullet 1341 Introduction to Linear Algebra
- 1362 Mathematical Reasoning and Proofs

The discussion groups I lead were comprised of a review of the theory covered in class followed by presentation of exercise questions while emphasizing problem solving technique students could apply on their own. I would like to highlight my experience with the class MAT 1362 Mathematical Reasoning and Proofs, which I was a teaching assistant for multiple times. This course was particularly challenging for students as they were generally unfamiliar with proofs and all the assignments were based on proof writing. Here, I learned how to teach the process of doing math; iteratively attempting ideas informed by your intuition, usually getting stuck, before finally achieving a solution that can then be rewritten as a clear proof. I also improved my skill at explaining proofs by developing my intuition for which parts of arguments students are likely to find confusing.

During my postdoctoral fellowship at the Memorial University of Newfoundland, there has unfortunately not been any opportunities for me to teach classes due to their seniority system among contract instructors. Nevertheless, after I gave a series of seminar talks, a few graduate students expressed their interest in learning the background algebraic geometry used in my work. As such, during this Fall 2023 semester, I am leading a reading seminar on algebraic geometry following the book "Algebraic Geometry I: Schemes" by Görtz and Wedhorn. The seminar is attended by graduate students, both masters and Ph.D., as well as by professors from the department. I view this seminar as valuable experience teaching graduate level algebra and I am therefore confident in my ability to teach graduate courses with the same quality I have taught undergraduate courses.

2. Philosophy.

Example Focused Teaching.

I imagine mathematical intuition to be a sort of muscle memory, akin to the reflexes of an athlete, musician, or craftsman, which is similarly developed through experience and practice. More concretely, I consider mathematical intuition to be familiarity with a wealth of diverse and thoroughly understood examples, as well as proficiency with the tools and techniques relevant to those examples. I think that developing such intuition is the rewarding part of learning mathematics and that it abates many of the frustrations commonly associated with the subject. I have found that students without a developed intuition often struggle to begin solving novel problems because they lack the awareness of which results and techniques could be useful. However, once a student develops an intuition they become able to fluently recall the general results of the subject, able to adapt known techniques to new circumstances, and able to produce illustrative examples of their own. I think that many people who have come to dislike mathematics likely did so in response to a learning environment which did not foster intuition, instead only presenting them with opaque tasks and memorization. In contrast, I prioritize using examples to illustrate new concepts and reinforce theoretical facts. In particular, I like to introduce topics with exploratory examples, pointing out an interesting phenomenon to motivate the general statements of definitions and theorems. I find this helps give a connecting plot line to my lectures which makes them more than a list of facts. Equally as important are (counter) examples which clearly outline the boundaries between concepts and help pre-empt common misconceptions. In this vein, I take pride in my ability to quickly create examples while lecturing which are tailored to answering students' questions.

Flexibility and Availability.

My policy of open flexibility aims to make students feel welcome and is intended to provide each student with the resources they require. I make it clear to my classes that I always encourage questions and that I am open to suggestions for improving the course. Suggestions I have received range from simple things, such as adjusting when lecture notes are posted, to more thoughtful feedback such as comments on exam formatting and structure. I take each suggestion into account and implement them as is reasonable. More mundanely, I practice a flexible blackboard based lecture style in which I am happy to detour in order to answer questions or address requests for additional explanation. I also find that blackboard lectures move at a pace students can more easily digest, allowing them to take their own notes and ask more insightful questions during the lecture. This is a style I mimicked while teaching online as well, where I shared my screen and wrote using a tablet.

Further, I think that many students who otherwise may succeed in mathematics are discouraged by the pacing of university courses. While the scheduling of the semester cannot be ignored, I recognize that students may need additional instruction time and resources in order to succeed in their studies. To offer this, I clearly communicate to my classes that, in addition to regularly scheduled lectures and office hours, I am always happy to schedule meetings with students in person or online at times which are convenient for them. I also use my policy of availability to assist my example based teaching. I encourage students to engage with exercises on their own time by letting them know they are always welcome to bring their attempts to a meeting for feedback.

3. **Student Feedback.** Below are selected quotes from anonymous student feedback I have received through the University of Ottawa's course evaluation tools. This feedback demonstrates my overall effectiveness as a teacher as well as students' positive reception of my policies of example based teaching, flexibility, and availability. The original reports these quotes are taken from can be found on my website.

MAT 1302 Mathematical Methods II, Fall 2022.

- "Math is not one of my strong suits but the professor has been the best professor I've had. He has been very helpful and understanding. He will go above and beyond with any help you request and is anyways there to help you. I don't think that the course or how it was taught could be improved."
- "Anyone would be lucky to have Prof Ruether as a prof. His style of teaching greatly increases the learning of his students and he is happy to be available to review concepts for his students. Down to earth and funny. A students learning dream."

MAT 1330 Calculus for Life Sciences, Fall 2022.

- "I love this course because of the teacher. Professor Ruether is an amazing teacher who makes class enjoyable and easy to understand. I like that Professor Ruether takes his time and makes sure to show lots of examples."
- "The professor for this course did a great job of providing many different examples of concepts learned in class to help us better understand and was always well prepared to answer any questions we had throughout the lectures, and if needed, he would answer any more specific questions following class to help clarify. There isn't much that can be done to improve this course or the teaching."

MAT 1341 Introduction to Linear Algebra, Spring/Summer 2021.

- "Professor Ruether is an excellent professor. He has clear command of the subject matter, engaging, and is able to effectively communicate the abstract concepts clearly. Professor Ruether truly cares about his students, and wants to put them in the best position possible to succeed. For example, he was available on weekends or late at night to address questions."
- "I'd like to start off by highlighting that I had a neutral stance on MAT 1341 at the beginning of the term. Over the course of the term, the professor has articulated complex topics clearly, provided good examples, and shows passion to assist students outside of class. I've enjoyed this class and taken a liking to the topics explored, thank you."
- "Ruether was enthusiastic, and he explained the concepts so as to appeal to our intuition (i.e. the content was presented such that natural questions were answered when they arose). As opposed to just regurgitating the textbook content, he explained the practical motivations for the things we were learning. I don't think anybody ever felt belittled for asking a question. Going through the examples, DGDs, and other recommended problems was conducive to doing well on the evaluations."