Teaching Statement
Justin Sawon

The main philosophy behind my teaching is that students learn by doing. Our role as educators should be to guide students in their own explorations and push them to actively engage in mathematics. This can involve training them how to apply a technique or algorithm to solve certain kinds of problems, it can involve providing a framework for them to think about a topic, and it can involve helping them refine their own ideas by listening and providing feedback. Of course we must also inspire them, and this involves presenting mathematics that we think is elegant, clever, surprising, important, powerful, etc., to foster enthusiasm in the subject.

Courses taught: I have taught a wide range of courses, from calculus 1 and mathematics of data science for non-math majors, to advanced graduate courses in commutative algebra and Riemannian geometry. I have taught more than 20 different courses in all, and would be comfortable teaching any undergraduate and most graduate courses in pure mathematics. Some innovations I have introduced into my teaching, and feedback from students, include:

- Low-stakes assessment: "There were daily opportunities to prove that we were mastering material - homework, group homework, quizzes, etc. This made me much less stressed on exams, and it allowed me to have a better idea of how I was doing in the class".
- Group homework: "I thought the group homework was really nice because it allowed us to interact with other students in the class, which isn't something you get in math courses".
- Breakout room (during online courses): "I found it very helpful to discuss smaller problems during class in small groups, as it helped to see multiple different attempts at how to solve a particular problem when the solution isn't readily apparent".

It is our job as educators to identify impediments to students being successful in our classes (such as test anxiety or isolation from peers) and find ways to address them. I strive to maintain rigor while giving students opportunities to grow and feel confident about their abilities, and this is corroborated by comments from my evaluations: "Prof Sawon gave challenging quizzes and exams but also offered extra credit on homework assignments. It was clear that he wanted to challenge us but also wanted us to succeed." and "This class at UNC is notoriously hard, and Dr Sawon taught it with rigor while being responsive, kind, and open-minded. I was always able to go to office hours, he responded to all my emails, and was always willing to talk through concepts".

I also find that most students will match their efforts to the effort of their instructor, indeed they are actually happy to work harder when they see that we are invested in their success: "He was always available to help and for long amounts of time. When we asked him to add more office hours he did so immediately and held them for six different sessions a week."

Problem seminar: At UNC I have taught the problem solving seminar (MATH294) for ten years. Initially it was aimed primarily at students preparing for the Virginia Tech and Putnam competitions. Since then I have developed this course to address a secondary purpose, namely, to introduce students (particularly first years) to a broad range of topics that they would not otherwise encounter in, say, the calculus sequence. Many of the students find topics that appeal to them, and go on to learn more in upper level courses, the Directed Reading Program, and other undergraduate research opportunities.

Study abroad: For the last ten years I have worked with the Study Abroad office to improve opportunities for science students. This culminated in my creating and leading a summer program in 2019, Math in Costa Rica, which I plan to resume as Math in Florence in 2023.

Undergraduate research: We are fortunate to have some exceptionally talented and motived undergraduates at UNC. I have supervised five honors projects and almost all of these students have continued their success in PhD programs. One has written a dozen papers/preprints and is now a postdoc at the Max Planck Institute, one will graduate from Oregon this year, one is a fourth year at Georgia Tech with five papers/preprints already, and another is a fourth year at Columbia who has already written an 84 page preprint. My most recent student was the recipient of a Summer Award for Research-Intensive Courses and later presented her work at the Undergraduate Mathematics Symposium at the University of Illinois Chicago.

My approach to undergraduate research is to center the work around a problem, ideally something that the students can explore from different viewpoints and understand some special cases. Even if the problem already has a solution (which we sometimes discover to be the case), they still learn how to do research by trying to solve it themselves. And they learn about the topic with greater depth and understanding than just by reading about it elsewhere.

Promoting diversity: Involving students in undergraduate research early on is also important for diversifying mathematics, as these students are more likely to stick with their major and continue on to graduate school and careers in mathematics. I have supervised undergraduate participants in the Science and Math Achievement and Resourcefulness Track (SMART) summer program for underrepresented minority students. I have worked with organizations for underrepresented groups, such as the Carolina Covenant (low-income), the Chancellor's Science Scholars (minorities), and UNC Firsts (first generation college students), to help recruit more students into the problem solving seminar. I have helped these students apply for summer REU programs and in some cases worked directly with them on research projects. In 2019 I joined the Math Alliance and have been serving as a mentor for the "Facilitated Graduate Applications Process", assisting minority students applying to graduate school.

Graduate program: I served as Director of Graduate Studies from 2015 to 2019. Following a period of six years with no female students completing a PhD in pure mathematics, I put an emphasis on diversifying our program through careful recruitment and enhanced support structures. I also made seeking external funding a priority, by encouraging and assisting students with their applications. These two goals were often complementary, as our female and minority students have been most successful in winning NSF Graduate Research Fellowships.

I have worked to enhance our graduate program in other ways too, for example, by organizing mini-schools in geometry for our graduate students (four mini-schools in the past five years).

Supervision: I have graduated four PhD students (one is now a tenured professor at St Thomas University) and three master's students. I am currently supervising three graduate students, who are fully supported by my NSF Focused Research Group grant and by an AGEP (Alliances for Graduate Education and the Professoriate) supplement to my NSF CAREER grant. I have also assisted my students in applying for NSF Graduate Research Fellowships and other external funding, such as the Ford Foundation grants for minority students.

I am supervising a departmental postdoc and mentoring an assistant professor.