TEACHING STATEMENT

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`The mysteries of faith are degraded if they are made into an object of affirmation and negation, when in reality they should be an object of contemplation. - Simone Weil`

0.1. **General views on teaching.** My approach to mathematics, as a teacher, is to invite students to contemplation. Not the quiet, individual contemplation of someone cut off from the world, but rather an active, collaborative contemplation of engagement with fellow students and with the instructor. I want to teach mathematics to share my excitement about the subject. I want to show that the excitement of doing math is in the act of "contemplating" or confronting the uncertainty of a difficult problem, not from being given a list of "pre-approved" formulas for each problem that comes up.

When I teach, my goals are that students:

(1) become comfortable with the difficulty of learning math, i.e. thinking about hard concepts without giving up (e.g. limits, infinite area, usual coordinate systems, 3D shapes and their cross sections)
(2) learn to communicate math ideas effectively, in a way that translates to communicating (mostly) any ideas effectively.

Both goals, I hope, serve to benefit students whose primary academic focus is outside of mathematics.

I make sure to emphasize that confusion is a normal part of learning math. I encourage students to get over the fear of confusion from the first day of class. Throughout the semester, I put this goal in action by facilitating a class environment that is friendly and open. I want students to see the second goal as a way to respond to the first: once a point of confusion is identified, the confusion can be put into words to initiate a conversation that clarifies and eventually resolves it. The second goal complements the first one, since students learn from experience that a productive conversation does not need to start with a perfect state of knowledge; proficiency with a math concept can develop over the course of a succesful conversation. I also lead students to engage in such conversations from the opposite role, i.e. to explain something they understand to a confused classmate. Understanding math only inside your own head is not the final goal.

0.2. **Specific examples of teaching strategies.** As part of the Michigan math department, I have learned to teach in Michigan style. This means that I do not think of teaching as a primarily lecture-based activity. Every class session has a problem-solving component, where students work in groups to answer problems on that day's material. When I do lecture, I ask questions regularly to keep students engaged. When students are hesistant to answer a question, I like to rephrase the question in "yes / no" or multiple choice format and invite students to answer by a show of hands. For questions that don't fit in a multiple choice format, I invite students to spend a minute or two to discuss with their neighbors before regrouping and moving on with the lecture.

I believe that an essential part of "contemplation" is the act of listening. It is essential that as a teacher I should listen to my students, and I encourage my students to listen to each other as well. During office hours, for example, I have students explain problems to each other rather than only relying on me as the instructor to answer questions.

Since becoming a teacher, I notice more acutely what works and doesn't work when I am the student. I know the frustration of having an instructor misunderstand my question when they prematurely assume they know what I'm trying to ask, so I am careful to avoid doing the same thing when working with my students. In my experience I have learned math especially well with

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teachers who focused on examples over abstraction, so I tend to teach new concepts by starting with a illustrative example. I know that from my own experience learning math, it is a huge resource to have a group of peers who are learning the same material at your level. (For example, when learning algebraic geometry I found huge benefits in joining a weekly reading group with other grad students to work through exercises together.) So it is important that my students are comfortable talking to each other in class and outside of class. If a group I have assigned doesn't have good chemistry, I try to rearrange students to improve the situation.

0.3. **Seminar talks.** I have spoken in seminars regularly throughout graduate school, to different audiences: to other graduate students, in research-focused seminars, and in undergraduate colloquium-like talks. I see seminar talks as another venue for sharing my excitement about math. When giving a seminar talk, I apply the same audience-engagement strategies that I use as an instructor. I also like to organize my talks to be heavily example-driven.

Concerning my colloquium talk at the University of Findlay, I received the following feedback from a faculty member:

> You did an amazing job identifying the audience's mathematical ability/confidence, and then being able to present some examples that clarified the topics to students. Your chosen examples like the currency exchange between countries really helped students understand your ideas. Overall, I was very impressed and you did a phenomenal job.

0.4. **Mentoring research.** I have found the role of mentoring student research to be very rewarding—it gives me the chance to faciliate contemplation of math ideas in the deepest sense.

Through Michigan's Laboratory of Geometry (LoG(M)), I had the opportunity to mentor three students in a project on origami configuration spaces. I liked how this research topic was grounded in very real, tangible physical objects, i.e. sheets of paper. This meant that terms like "moduli space" and "local approximation" could be conveniently demonstrated with a physical model. Part of our project was to write code to show a visualization of the origami configurations which we were classifying. The following semester, one student told me she was inspired to consider graduate studies in math seriously and we continued to meet to extend the results of this project.

My own taste in mathematical research centers on ideas that do not require an extensive amount of technical build-up, and that are typically accessible to students in undergraduate level classes. (For example: graphs, 2-dimensional Euclidian / spherical geometry, linear algebra, piecewise linear functions, polynomials.) This is a fairly well-known benefit of doing research in combinatorics. With tropical geometry, problems can be approached from a combinatorial perspective but also have direct parallels with algebraic geometry, so research questions can serve as a bridge to more advanced, graduate-level topics.