Teaching Statement
Lucas Sabalka

In my professional career, I have taught classes of all sizes from 5 students to 280 students, from introductory-level mathematics to calculus to advanced undergraduate courses to graduate courses. Through all of these courses, I have found that first and foremost I enjoy teaching. Conveying knowledge to students, and seeing students grow and advance with comprehension, is very fulfilling for me. Based on my experience, I have developed a philosophy of teaching which I find to be productive and rewarding for both me and my students. My philosophy of teaching mathematics is twofold: to convey my enthusiasm and passion for mathematics, cultivating an appreciation for the beauty of mathematics in my students; and to engage my students with me and with the material by encouraging interaction. I make my presentations energetic in order to foster a dynamic classroom environment. I always encourage questions and student interaction, with classes of all sizes. I strive to be clear and engaging, always taking the time to present material comprehensively. I believe my efforts are appreciated by my students, as indicated for instance by my appearance on the Incomplete List of Teachers Ranked as Excellent for both of my semesters teaching at the University of Illinois.

I am currently teaching a course called Number Systems. The point of this course is not to teach mathematics per se, although the course does cover interesting mathematics (the integers, the reals, and the rationals, Fibonacci numbers, modular arithmetic, cardinality, public-key cryptography, etc.), but rather to teach how to write proofs. The art of proof-writing is a difficult skill to cultivate, and requires a large amount of introspection on the students' part. Guiding students through this process has been stimulating and engaging for me. The format of the course is to have roughly one homework assignment per class. Each assignment can be turned in as many times as a student likes within a two week window. I grade using the "red line method", where I read a proof up to the point of the first mistake, underline the mistake, and then give it back to the student to fix. Students on average take 2 to 3 attempts to arrive at a correct solution. Allowing multiple turn-ins keeps the focus squarely on their writing. It is a rewarding and fulfilling experience for me to watch the written voices of these students mature before me.

One of my tenets of teaching is to focus on the needs of my students. For this course, as I do for all of my courses, I devote the first portion of each class to discussion questions and homework problems, where the class and I have a conversation on how to approach and solve exercises of their choice. This interactivity greatly increases my students' comprehension and engagement with me, the class, and the material. In these discussions, I try to guide students to discover answers for themselves. We learn best from the journey of discovery, not from being told the answers. I prompt my students with hints, but I always wait until someone is able to figure out the solution and chooses to share it with the class. While presenting the material, I continue this open dialogue between me and the students by encouraging questions and treating each one with respect.

In two past semesters at Binghamton, I was the principle instructor for a course called Math in Action. While the focus of Number Systems is to teach proof-writing to a small group of math majors, Math in Action is designed to be both a large-lecture introduction to college mathematics and, for many

students, the last mathematics course they will ever take. In the two semesters I taught this course it had 280 students and 162 students. I was responsible for giving 3 lectures per week to the entire class, coordinating activities like quizzes, pop quizzes, and tests, and overseeing 4-6 teaching assistants who instructed 6-10 discussion sections of the course. As Math in Action counts towards a general education requirement, many of the students had a low level of interest or engagement in math. Learning how to address and engage such an audience was a challenge, but one which I believe I conquered. I have a loud speaking voice, so I am consistently able to maintain control of even large classrooms. Even for courses as large as these, I encourage students to participate in my lecture and raise questions throughout. Allowing for questions not only lets me address subjects of confusion and gives me an indication of student comprehension, but it also gives the students more comfort and confidence in a class where many have a high level of math anxiety. Allowing questions in such a large class gives me a way to develop a connection with many students in what can otherwise be an impersonal environment.

Outside of courses, I have pursued the teaching through various venues. One of my most exciting activities for me has been my regular contributions to the Binghamton Press and Sun Ask-A-Scientist column. For the past two years, I have written a number of articles on various scientific questions of students ranging from kindergarteners to 8th graders, answering questions like, "What is the biggest number?", "How does thunder work?", and "How do trees make oxygen?"

For the past two years, I have organized the Toeholds in Topology Graduate Seminar series here at Binghamton. Toeholds is a student-driven seminar series that includes a couple of talks from researchers, but usually has a graduate student speaking in a no-professor venue. My job with Toeholds is to suggest topics to the students, help the speakers prepare for their talks, and most importantly give direction and feedback during and after the talk to help the student improve their teaching ability and presentation style. It is always a pleasure to see a student's speaking skills progress and evolve.

When I was at UC Davis, I led 3 Research Experiences for Undergraduates (REUs) as well as multiple graduate seminar series and reading groups. For one of the three REU projects, the two students involved (now both graduate students) have submitted one research-level joint paper for publication. One of these students was so engaged by the material that he has worked independently but in contact with me for the past three years, and now has a new paper on questions related to his original research.

I have had the opportunity to teach over a dozen stand-alone courses, including matrix theory, calculus, topology, geometry, and complex analysis. These courses took place at various institutions: as a graduate student at the University of Illinois at Urbana-Champaign, as a postdoctoral scholar at the University of California, Davis, and now as a postdoctoral scholar at Binghamton University. Each student body and each university has given me a different experience and a unique perspective on teaching. In my opinion, one of the fundamental responsibilities for mathematicians is to convey their knowledge to others. Inspiring excitement in students is the most satisfying aspect of teaching. My goals are to teach clearly, engagingly, and energetically in order to share my passion for mathematics.