Teaching Statement: Jack Jeffries

I have benefited immensely from having great teachers and mentors in my life, and I strive in my own teaching to try to pay back to the world what I have gained from their influence on me. I pursue this goal by teaching mathematics to students of various levels, by sharing an enthusiasm for mathematics in creative and interactive techniques, and by engaging in other mentoring and educational outreach activities.

I have had the opportunity to teach at the university level since my undergraduate days. At The Ohio State University, I led recitations for four quarters. Responsibilities included preparing twice weekly review and problem sessions, writing and grading quizzes, and grading exams. In graduate school at The University of Utah, I was the instructor of record for a wide variety of classes, including advanced undergraduate classes (Complex Variables and Linear Algebra), large intro classes (Intermediate Algebra with 130 students), and specialty classes (Intro to Statistics, Business Algebra). At the time, graduate instructors were afforded a large measure of autonomy, and responsibilities included essentially everything except choice of textbook. At The University of Michigan, I was the instructor of record for Calculus I, Linear Algebra (and introduction to proofs), Abstract Algebra, Commutative Algebra I, and Commutative Algebra II. Two of these courses, Abstract Algebra and Linear Algebra, were conducted with as flipped/inquiry-based learning classes; Abstract Algebra was conducted this way for the first time at U of M, and Karen Smith and I developed all of the course materials (worksheets and WebWork) for the course. Commutative Algebra I and II are mainly lecture-based, but I paired that with occasional worksheets. I wrote and typed my own course notes and worksheets for these classes. I am also teaching Commutative Algebra I in CIMAT.

In my teaching, my main goal is to instill in the students an appreciation for the material as well as the expected technical proficiency. I aim to do this by engaging students in activities during class, by sharing my enthusiasm for the mathematics, and by focused discussion on the mathematical and nonmathematical meanings of fundamental concepts at as basic a level as possible. I regularly include nonlecture elements into class, such as group work; in multiple classes I taught, this has been the main class dynamic. In lecture, I try to facilitate an interactive dynamic, and whole-class discussion. Some examples of interactive activities that have been successful include "3D Fridays"[1] in Linear Algebra, in which towards the end of class I would distribute red-blue 3D-glasses and show some examples in 3D on Geogebra. This helped the students to appreciate geometric concepts from the course, like the volume interpretation of the determinant. Another fun activity is the "footquiz," an adaptation of a colleague's idea: a multiple choice question is written on strips of paper with the letter-to-answer association mixed. Students decide on an answer, then walk to a corner of the room marked with the associated letter. This gives a quick low-pressure way to get feedback while making students physically active. Beyond implementing active learning techniques, in lecture I aim to be concrete and accessible, using both down-to-earth intuitive language and motivation as well as the proper formalism (and indicating the relationship between the two).

Mentoring and outreach are also key components of my personal teaching mission. A couple of summers ago, my colleague Sema Güntürkün and I directed an REU project with

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[1]This did not always occur on a Friday.

an undergraduate at The University of Michigan. Over the course of the summer, we were able to introduce some key concepts in Commutative Algebra and Algebraic Topology to the student, as well as some new algebraic approaches to problems in neuroscience. This work culminated in a paper that is now published in the Journal of Algebra and its Applications. With two other colleagues, Canton and Grifo, last summer we directed another REU project with two students at UM. I am also directing a masters thesis and codirecting an undergraduate thesis this year at CIMAT. In the future, if resources permit, I am interested in running or assisting with bridge programs designed to help talented undergraduates with weaker backgrounds brush up on areas where beginning graduate students often lack preparation, such as advanced linear algebra and point-set topology. Following models from which I benefited as an undergraduate, I have developed vertically-integrated reading groups, such as BIKES, a junior Commutative Algebra seminar at The University of Utah. This seminar pairs together a younger student with an advanced student or postdoc, and the two present a foundational paper together. The goals of BIKES are to encourage younger graduate students and advanced undergraduates to speak and to provide them with an older graduate student or postdoc mentor. In the future, I am interested in developing other vertically-integrated seminars, e.g., on areas of classical mathematics often neglected in the curriculum, such as continued fractions and elimination theory. I have also been a regular volunteer for Wolverine Pathways, a program that offers full scholarships to UM to selected students from underprivileged and underrepresented backgrounds that attend enrichment classes every weekend. With Jonathan Montaño, we are organizing a graduate summer school in Barranquilla, Colombia for June 2020.

In my next career phase, I look forward to continue teaching new classes and trying out new fun ways of engaging students. I also look forward to connecting with students outside of the classroom and increasing the reach of the mathematics community in creative ways.