Few great scientific advances are confined to a single domain and interdisciplinary problem solving is in the future of any student pursing applied mathematics and statistics. In industrial or academic science, an applied mathematician must learn to communicate, think critically and collaborate effectively with experts from other fields. To better prepare students academically for their futures, I believe that group work, experimental and case study learning are essential teaching methods to include in the classroom. Massive Open Online Courses have demonstrated that it is largely possible to replace traditional lectures with online coursework. However, the classroom can provide invaluable experiences for developing abstract problem solving skills, teamwork and communication, all of which are necessary skills for a truly capable scientist to master. Supplementary to online lectures, non-traditional classroom experiences deepen students understanding by encouraging them to apply theoretical concepts to open ended problems and to work effectively in teams to arrive at results.

As a classroom instructor, I implemented these non-traditional educational techniques most extensively in Mathematics Topics: A Climate of Uncertainty, as an introduction to the mathematics of modeling climate. In this freshman seminar at the University of North Carolina at Chapel Hill, I designed the homework, lectures and a final research project in modeling and analyzing future climate scenarios based on carbon policy decisions. The content of the seminar, and flipped classroom approach, was based in my experience as a teaching assistant for my PhD advisor for freshman and graduate level mathematics of climate modeling courses. In addition I received teaching instruction in the mathematics department graduate teaching seminar, and I trained in curriculum development and activity based learning in the Future Faculty Fellowship program through the UNC Center for Faculty Excellence. In the Future Faculty Fellowship program, I studied how to utilize interactive learning in the classroom and to deploy novel technology to enhance student experiences. As a research assistant for the for the Mathematics and Climate Research Network (MCRN), I furthermore developed and maintained open educational resources on the MCRN Hub `https://mcrn.hubzero.org/`.

My experience with the Math and Climate Research Network and training in the Center for Faculty Excellence prepared me to design and implement a novel, interdisciplinary mathematics seminar for freshmen at UNC. Using open source coursework from University Corporation for Atmospheric Research, the National Center for Case Study Teaching in Science, and the educational climate models EdGCM and C-ROADS, I took advantage of the plethora of high quality open educational resources available to instructors on issues in climate and weather forecasting. Students completed video modules with comprehension quizzes as homework, and with classroom time we engaged in parallel climate modeling experiments and case study activities to deepen their understanding. As there was no mathematics pre-requisite for the course, we were limited to studying algebraic equations and elementary statistics, but using educational computer models allowed us to concretely explore the concepts in their homework, testing hypotheses developed from their readings.

The flipped classroom approach in my undergraduate seminar utilized classroom time more effectively than traditional lectures because students could work through routine problems and textbook learning at their own pace, while in our time together, students applied their understanding, exercising abstract problem solving with peers. This approach also utilized my instructor time more effectively: routine grading was automated with online quizzes while my increased interaction with my students allowed me to identify weaknesses in my students' understanding so that I could adapt my lessons to support their learning. Furthermore, my direct interaction with students in activity and project learning created an inclusive environment, crucial for science and science and mathematics education, where all students were encouraged to participate. My course materials and syllabus are archived at `http://aclimateofuncertainty.web.unc.edu/`, and my students allowed me to share a sample of their final climate modeling project, hosted here: `http://aclimateofuncertainty.web.unc.edu/files/2013/04/Climate-final.pptx.pdf`.

In addition to my flipped classroom experience, I have led a traditional lecture section of integral calculus at the University of North Carolina at Chapel Hill, and I have extensive experience as a teaching assistant and mathematics tutor at UNC and

the University of Oregon. Since moving to the Nansen Environmental and Remote Sensing Center, I have continued developing my mentoring experience, supervising an Erasmus Plus training internship in mathematics. From June to August of 2017, I acted as the direct supervisor of Armand Vic, a visiting masters student from the École Normale Supériure de Rennes. In this experience, I practiced my project leadership and developed my communication skills with students for whom English is a second language.

In my future teaching, it is my ultimate goal to utilize activity learning and flipped classroom design in traditional core undergraduate and graduate courses. I believe that universities have a duty and a practical need to distinguish the value of their classroom experiences from traditional lectures which are increasingly being replaced with novel technologies. By taking advantage of the opportunities these technologies offer, mathematics departments are in the position to innovate in teaching, and create an inclusive and interdisciplinary environment in which we foster the next generation of scientists. I would be highly eager to collaborate with Aleksey Telyakovskiy, building on our respective experiences with interdisciplinary mathematics and climate modeling courses, to offer novel courses in mathematics and statistics with applications. I thank the committee for its consideration, and I look forward for the opportunity to develop innovation in teaching at the University of Nevada, Reno.