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Teaching Statement

When I first became a Teaching Assistant, I found myself hoping to engage with dedicated students who are actively interested in learning the course material. It is a pleasure to teach when students ask questions, and make comments about a specific step done in a derivation or proof. However, my first year of teaching was in the calculus sequence where I spent a significant amount of class time showing how to compute derivatives and integrals [1]. As I have grown as an educator, I realized that the most important part of the classroom is active learning through student feedback [2,3]. As a result, I have structured my teaching so that students can openly ask questions and present their own solutions to coursework.

My approaches in the classroom

Over the years, I have found that students understand course material much better when they are actively engaged during lecture. To this end I strive for my lectures to be very interactive, where students are encouraged to present their own solutions and ask each other questions. Due to the coronavirus pandemic, a lot of teaching has taken part in a hybrid format where instructors teach courses in person and online through Zoom. To increase student participation in Zoom sessions, I have dedicated one day per week to student presentations. In these presentations, students select one problem and give a short five or ten minute presentation of the solution. This provides two key benefits. The first is that students learn how to speak in front of a group and learn how to prepare material for public presentation. The second is that one of the best ways to learn something is to teach it to someone else.

A skill that I hope to nurture in all of my students is the ability to overcome the fear of being bad at math. I have dealt primarily with students in the introductory courses: precalculus, calculus, and differential equations. Many students enter these courses with the false belief that being good at math is an innate ability which they don't have. To overcome this, I often encourage these students to come to my office hours and present their own solutions. This helps increase their confidence and gives them practical experience doing mathematics. In the upper level courses I interact directly with students and encourage them to ask me questions in person and through email [4]. Two of the students enrolled in my numerical analysis courses at UIC are now entering graduate school as PhD students in applied mathematics and quantitative finance.

Finally, as different students have different learning styles, I try to be flexible in the way which I present material. I am an analytical thinker who is comfortable manipulating equations and dealing with more abstract concepts introduced in calculus and real analysis. However, during my second semester teaching precalculus, I noticed that a lot of students [5,6] prefer more geometrical approaches. I started to form alternative solutions to practice problems and gave alternative solutions to the material presented in lecture. The students immensely enjoyed this and were motivated to prepare their own solutions to present to the rest of the class. Every semester, I encourage students to write feedback through confidential teaching evaluations so that I can become a better teacher [7].

Broader Impacts

Before I started graduate study, I worked for several years in the software industry in roles such as software consultant and programmer. In my third year of employment, I was involved with training both clients and coworkers in the technical aspects of the internal programming language. I found this to be one of the most enjoyable parts of my job. Over the weekends, I tutored local middle school and high school students in the subjects of algebra, geometry, calculus, linear algebra, and computer programming. As a graduate student, I had the opportunity to be a teaching assistant for the departmental numerical analysis course twice. In this I was able to teach both mathematics and engineering students how to write computer programs in Matlab. In specific, I was actively

involved in teaching how to implement root-finding algorithms as these are among one of my favorite aspects of applied mathematics.

I am proactively interested in promoting the use of numerical computing in mathematics. Through working on several projects including two summers at national labs, I understand the importance of learning the fundamentals of high-performance and parallel computing. In 2015, I wrote a computer implementation of the Riemann-Siegel formula to find zeros of the Riemann zeta function on the critical line. Since then, I have received multiple inquiries about technical aspects of the zeta function. I am proud to say that some of these have turned into projects where a student or professional is now working on writing their own implementation of the Riemann-Siegel formula. I would like to continue working on these projects and take leadership of a future project with an undergraduate or PhD student.

Future Goals

I plan to continue learning new programming languages and to get more involved with both undergraduate and graduate students. I feel the need to include Matlab exercises and practice in existing undergraduate courses such as differential equations, mathematical biology, and applications of applied mathematics. In Chicago we have the Math Circles of Chicago program that is tailored towards K-12 students and I would like to get involved with a similar program as a postdoc. As I am close to completing graduate studies, I will investigate becoming part of Project NExT.

Comments from Student Evaluations

All of my student evaluations at UIC are available at http://homepages.math.uic.edu/~mkehoe5/teaching.html.

[1] "He thoroughly explained the problems and clarified if anyone had questions." -Calculus I student at UIC, Fall 2018.

[2] "The teaching assistant was very patient and allowed for students to ask as many questions and went through material thoroughly." - Calculus I student at UIC, Spring 2020.

[3] "He explained the subject very well and stopped and explained anything further if anyone had a question. He also gave us very nice problem sets to work on that was relevant to our classwork." - Differential equations student at UIC, Fall 2019.

[4] "Very helpful office hours. Matt was extremely patient and willing to work through problems without merely providing answers without explanation." - Differential equations student at UIC, Fall 2019.

[5] "The TA would go over math problems if the class had trouble with them. He would also show the class easier and efficient ways of doing the math problems compared to the way it was taught during lecture." - Precalculus student at UIC, Fall 2018.

[6] "He taught a unique and different approach than what we were learning in the lecture. Sometimes his methods were easier to use which helped a lot." - Precalculus student at UIC, Fall 2018.

[7] "Discussion is where I feel I actually learn, understand, and grasp the material, so I'm glad that my TA was good at explaining how to problems and would answer questions well when a student was confused. He was often the one who found mistakes in answer keys which was nice since we were the first to know without any confusion. -Calculus I student at UIC, Fall 2018.