Statement of Teaching Philosophy
Alexander L Young

At this point in my mathematics and statistics, I have had the opportunity to work in several roles teaching a variety of topics with a diverse collection of students. As an instructor, I have taught courses in college algebra, precalculus, single variable calculus, linear algebra, and statistics. I have also taught multivariable calculus and differential equations to high school students as a NSF GK-12 fellow through the G-TEAMS program, and I assisted with an undergraduate course in analysis and a graduate course in linear algebra and numerical methods as a Super-TA. Finally, I have mentored students in both academic and industry-driven research projects. In each of these settings, I have observed that more interested, engaged students tend to be more successful regardless of preparedness. As such, I tailor all of my interactions with students so I can help them develop an increased appreciation for mathematics.

Constructing an engaging, active classroom

To create an active learning environment for my students, I utilize a few specific strategies: using class time for students to work on examples, highlighting applications of course material, and focusing on the connections between topics.

Allowing class time for students to work on problems encourages them to begin applying concepts, requires them to be active learners, assists in building an environment where they feel comfortable discussing and asking questions, and allows me to directly observe them in the process. By observing their attempts at problems, I am able to immediately identify and address misunderstandings, misconceptions, and common mistakes. Additionally, I am able to move about the class talking to students individually and developing my rapport with them. In doing so, I can build an understanding of their mathematics background and future academic plans. I then use this information to select or design examples which show relevant applications for the mathematical skills that need to be developed in the course. I strive to help students see the value of building mathematical skills and how mathematics fits into their education. This strategy makes my classrooms more lively as students are more likely to share anecdotes about their personal interests, coursework, and research.

Encouraging students to take ownership of their learning

To encourage students to take ownership of their education in mathematics, I focus on helping them find value in course topics by discussing potential applications for the material. My background in applied mathematics is particularly useful in this context as it often enables me to reference instances where I have used (or seen) a technique in action. For classes reviewing algebra techniques, I discuss the material in the context of future mathematics courses. For upper level courses such as calculus or differential equation, it is more straightforward to employ this strategy as I can highlight applications to problems in their majors or in my personal research. For engineering students, I outline how future classes such as thermodynamics and kinematics rely heavily on concepts from calculus. For students in the biological sciences, I mention the use of differential equations in modeling and simulation and discuss how a background in calculus enables one to understand probability and statistics. For students engaged in independent research, I address their specific interests during office hours or when they ask questions in class. I was also able to extend this technique to the design of complex, applied projects during my G-TEAMS fellowship. To my delight, a number of students have shared stories where topics we covered in a course later helped them with senior research projects or research papers they co-authored.

Outreach and mentorship

While I have spent the most time working with students in structured mathematics courses, I have also shared mathematics with students through outside projects and applications in industry. The two years I spent as a G-TEAMS fellow enabled me to work with high school students at BASIS Tucson North, one of the most successful mathematics and science schools in the country. During that time, I was able to share my knowledge of advanced mathematics with a number of students by discussing my research, helping them with independent studies of their own, and giving lessons on topics which extend beyond the usual K-12 course offerings. Furthermore, I developed a number of advanced projects to supplement their coursework and push them to consider more sophisticated or difficult applications of the material. Aside from G-TEAMS, I spent two semesters mentoring University of Arizona students enrolled in the capstone modeling and simulation course. In those semesters, the students I worked with extended the results of a few academic research papers on studies of sand dune formation and stationary points in planetary orbits. In both settings, my principal role was to help them further their knowledge and I have found each of the experiences to be highly rewarding.

Connecting students with industry

During my work with Takeda Pharmaceuticals, I designed research proposals and mentored the undergraduate students who worked on them. These projects were geared towards developing an understanding of the effects of chemotherapeutic treatments on composition of a tumor cell population. In addition to helping my students translate their mathematical knowledge into usable techniques, I helped them gain a background in modeling and oncology research, and I shared aspects of mathematical research to which they may not have otherwise been exposed. Of course, it is not always possible to directly connect students with industry in this manner. However, the experience of working with Takeda has helped me understand skills which are valued in industry and given me anecdotes to share in the classroom which highlight the value, applicability, and translatabilty of mathematical techniques.

Concluding remarks and future teaching goals

Given the broad teaching opportunities I have been given, I have direct experience teaching undergraduate courses in remedial algebra, statistics, probability, and single/multivariable calculus. Additionally, given my mathematical background and comfort with developing lessons and course material, I am able to contribute to the teaching goals of a department by instructing courses on differential equations and advanced undergraduate/early graduate courses in probability, statistics, multivariable calculus, and linear algebra. Preferably, I would like to incorporate the techniques I have outlined above when teaching advanced courses in probability and statistics.

Regardless of setting, I share my passion for mathematics with my students and they respond positively to my enthusiasm. The teaching strategies I outlined above have been effective in helping previous students succeed and value mathematics. On end-of-semester course evaluations, it is common for multiple students to remark on the engaging, effective nature of my lessons, my ability to address confusing areas, and the assistance provided by the selection of examples. (A summary of the course evaluations can be found on my website.) In addition, a number of students I worked with as a G-TEAMS fellow have updated their collegiate plans to include a minor or major in mathematics. I relish each of these stories as they further my belief that by sharing my love of mathematics with students I can empower them to find value in mathematics. While some may never share my passion for this subject, if I have increased their knowledge and appreciation for mathematics in some degree then I have achieved a level of success as their instructor or mentor.