# Teaching Philosophy

First and foremost, as an educator I establish an inclusive classroom community that is respectful of all identities and pronouns. For this reason, it is important to me to be open with my own LGBTQ identity and present myself as a support structure for underrepresented minorities. I clearly establish this respect at the beginning of the semester in the form of introductions and resources. This also motivates my application of active learning techniques, which benefit most students but especially underrepresented minorities. Additionally, I show respect for the individuality of every student's learning styles by giving them ample choices to customize their own learning experience.

Many students carry a passion for enacting a positive change in the world. This passion is a powerful learning tool, but of course students must be convinced that the course material is in fact relevant. This is a strength of mine, as I have developed strategies for incorporating elements from the literature of applied research into the classroom. My research interests, including health and equity, often lead me to pressing social challenges in the world, and nearly every social, political, or economic challenge has been written about by a mathematician or operations researcher at some point. Introductions in my classroom include gathering of world issues that interest the students, and then even a brief review of the literature opens the door for lesson adaptations and case studies driven by the students themselves. Students of all levels can be introduced to mathematical research at even the surface level; for example, an undergraduate optimization student can search for the decision variables of an integer programming model and identify the objectives. In doing so, students get introduced to impactful research on a topic of their interest, to critically reading academic literature, and to decomposing large problems into solvable subproblems, which is essential to all mathematical ventures.

One concept that Robert Barr and John Tagg write about deeply resonates with me: teachers should be *coaches*. However, I think there is an important component missing in mathematics classrooms. Teachers need to be *cheerleaders*, as well. What topic makes students feel more inept or incapable than math? I design engaging lectures that provide students ample opportunities for small successes, which iteratively builds confidence on top of new knowledge. The literature shows many benefits of collaborative learning, and an important one is the self-efficacy of students. I develop a learning community in the classroom by utilizing group work and active learning techniques. For example, "jigsaw" activities allow students to specialize and become an "expert" on a certain concept or problem, then to tutor among their peers in a mutually beneficial way.

Much of my teaching strategies have been refined in the extensive time invested into creating teaching tools. For instance, I have spent at least four years working with Amy Langville at the College of Charleston carefully designing a creative, interactive reinvention of the common calculus textbook. This *Deconstruct Calculus* workbook series is a spiral-bound workbook that is meant to be tossed, ripped, folded, and nearly destroyed in the interactive approach to bringing calculus to life. Furthermore, Amy and I have collaborated on a multi-pronged approach that includes concept questions and calculation questions that build to challenge problems. A second tool that has recently begun to be developed is an online dashboard with interactive modules that visualize concepts for an introductory engineering optimization course. For example, students

can modify integer linear programs and compare the optimal LP solution to the optimal IP solution. These individual modules can be designed quite quickly and iteratively improved over time. Between the workbook series and the interactive dashboard, I have created tools that can be customized by individual learners, engage students in new ways, and dynamically grow their conceptual development.

To enhance conceptual development, I utilize abstractions such as analogies and concept maps. For example, analogies to everyday objects (such as binary decision variables as light switches) not only makes a new concept more relatable, research supports that it also connects the new knowledge to existing experiences for longer lasting memory. My students also create their own analogies, and together we explore the limitations of these analogies, which is additionally instructive. Another useful tool for concept development is the creation of concept maps, which can be created multiple times throughout the course to concretely show a student their own growth and development. These strategies drive home the more important concepts I intend in my courses, beyond just the algebraic, computational skills.

I support project-based courses that allow students to choose assignments that suit their own strengths and needs for learning. For example, assignments can involve coding, visual design, or lesson planning, each of which would be attractive to students of various majors and interests. In doing so, I can also instruct skills that are transferrable outside of my own classroom, including computational and communication skills. By allowing students the flexibility and creativity to design and implement their own work, they care and remember more about the course material.