

## **TEACHING STATEMENT: AMANDA YOUNG**

My first year undergraduate mathematics professors sparked my passion for pursuing an academic career. Their teaching made mathematics feel intuitive, thoughtful and engaging, and inspired me to change my major to mathematics. These courses reaffirmed my love of mathematics and ignited my enthusiasm for teaching. I quickly sought out tutoring and research opportunities that motivated me to continue in academia. The impact these professors had on my life instilled in me the importance of teaching and mentorship. This is a responsibility I hold dear, and I find great joy and reward in working with students. While I am always looking for new ways to improve and be innovative in the classroom, my professors' examples laid the foundation that I still base my teaching philosophy on today.

### 1. TEACHING PHILOSOPHY

Each class session, I want my students to master new mathematical skills, grow as analytical thinkers, and feel that my class is having a positive impact on their academic journey. My aim is to make mathematics feel natural so that students stay engaged in the critical thinking process and can experience the personal satisfaction of discovering solutions. Making mathematics feel intuitive does not make it easy, but it does help alleviate the anxiety that often hinders learning. I try to reinforce this by making a warm and welcoming classroom environment that also inspires active participation in the learning process. I love engaging my students in discussions and I feel proud when they succeed at mastering a challenging concept. To help them realize their potential, I frequently give them feedback on their progress and try to be flexible in my teaching to better support their educational needs.

To make each lesson feel intuitive and inviting, I structure lecture plans around examples that motivate or illustrate the main concepts and naturally lead students through the material. I also incorporate break out problems, worksheets, or class discussions for students to engage in and help develop comprehensive understanding of the content. I aim to choose activities that best address the specific goals of each course. For example, in an introductory course I often incorporate more worksheets to reinforce problem solving techniques, while in a proof-based lecture I frequently lead class discussions so that students actively participate in the abstract thinking process. Beyond reaffirming the core concepts, these activities help my students build confidence and pride in their problem-solving abilities while finding joy in mathematics.

I love engaging with my classes, and I strive to create a welcoming environment where every student feels comfortable contributing to the discussion. For me, this begins on the first day of class, when I repeatedly encourage questions, and have students complete a survey so I can better learn about their academic goals, mathematical background, and personal preferences (such as a preferred nickname). Throughout the semester, I continue to invite class participation with my lecture style and class activities. I often introduce concepts by asking leading questions that motivate students to think in the correct direction. I find this gives my lectures a conversational and relaxed feel, and within a couple weeks students will enthusiastically offer solutions or explanations for the topic at hand. This informal formative assessment is especially helpful for identifying and clarifying points where students have misunderstandings. These are meaningful learning moments, and I make it a point to respond positively to encourage future contributions. Welcoming all student ideas produces a dynamic dialogue that is a great learning tool in itself. These discussions allow me to demonstrate the (often messy) exploratory process for finding a solution, which is then transformed into a clear, concise solution on the board. Finally, I find that engaging with my students makes lectures more fun and enjoyable, and an overall bright spot in my day.

Part of effective classroom communication is giving and receiving feedback. I have high standards in my courses, and for students to succeed it is important that they have a firm grasp of class

expectations. Beyond providing a clear syllabus and discussing grading rubrics, I reinforce these standards by modeling complete solutions in lecture and giving significant written or verbal feedback on submitted coursework. I also make sure to praise students when they do well, and alert them to common homework mistakes. To ensure that this does not discourage students, I always make sure that this is done with kindness and grace.

Instructors are not perfect, so it is also important for me to be responsive to student feedback and make adjustments in the classroom to help them be more successful. In the end, each course is about helping students achieve their potential, and I need to be flexible in my teaching style to best meet this goal. An example of this came from when I taught introduction to linear algebra in Fall 2017. At the end of each week I had students work in groups on a review worksheet. One lecture, though, I had students solve break out problems throughout the period to immediately reinforce the new concept. After that class a student expressed how much he enjoyed the new format, a view that was later reaffirmed by a class poll. I decided to rework my lectures to include break out problems for the rest of the semester. Being adaptive and flexible with my instruction paid off: even with my high standards the class did exceptionally well that term, and had the highest grade distribution of any course I taught at the University of Arizona.

*Selected Student Comments.* The following student comments exemplify how my classroom is a thought-provoking, warm, and friendly environment that fosters discovery-based learning, empowers students to become independent thinkers, and invites all to experience the joy of mathematics.

- (1) *“The course feels like it’s team-taught with the students and encourages deep thought. I feel like part of a community of students.”* - Math 413 (Spring 2019)
- (2) *“Amanda completely demystified linear algebra for me. Going into this class, I was nervous because I had heard this was a particularly difficult course and it wasn’t easy to grasp. Amanda made sure that each lecture was worth it and I feel completely comfortable with the subject matter now. I would definitely recommend Amanda to anyone who needs to take a math class because she is one of the best instructors I have ever had.”* - Math 313 (Fall 2017)
- (3) *“The professor was required to cover a large amount of content in a short amount of time, but never did I feel as though the class was rushing through material. This professor efficiently taught the essentials of each subject. She clearly stated rules, warned of common errors/misconceptions, and provided an ample variety of problems. I also really liked the worksheets the professor provided.”* - Math 122A (Fall 2018)

## 2. TEACHING EXPERIENCE

I have a wide range of teaching experiences that span over 15 years. My first experience was tutoring at the on-campus learning center as an undergraduate. After graduating, I spent two years working as a math instructor for homeschooled students in middle and high school. I then returned to graduate school where I led many discussion sections and taught a calculus course. For my efforts, I was awarded the William Karl Schwarze Scholarship for excellence in teaching, the department’s most-prestigious graduate student award.

Joining as a postdoc at the University of Arizona, I was excited to work with the excellent math education group in the department. This group strongly influences department culture, and postdocs are encouraged to try innovative learning techniques and contribute to curriculum development. During this time I was able to teach both upper and lower division undergraduate courses, including co-listed master’s classes. I also contributed new curriculum for two courses: the proof writing seminar (Math 396L) and a new online calculus course (Math 125). For the latter, I had the opportunity to work closely with the calculus course coordinator as she developed their

new online program. To grow as a mentor I sought out mentoring opportunities, and had the opportunity to work with undergraduate teaching assistants and advise two undergraduate honors projects. I also enjoyed contributing to outreach, including volunteering for the department math circle and co-organizing a spring school for graduate students and fellow postdocs.

Even though my current position through the Munich Center for Quantum Science and Technology is a research position, I have still engaged in several teaching activities over the past year. I helped develop course materials for a master's program at the Technical University of Munich (TUM), and I am currently co-mentoring a bachelor's student who plans to continue working with us for his master's degree. I also recently co-organized a reading course for a group of PhD students and postdocs at TUM, and will potentially teach a class in Summer 2021.

*Undergraduate Research.* I believe that mentorship is an important component of the mathematics community. Lifting up students and helping them become better teachers and researchers is vital to our culture. A particularly rewarding experience for me was advising two undergraduate students at the University of Arizona for their senior honors projects. Both students took the proof-based linear algebra course (Math 513) from me in Spring 2017. They were both exceptionally engaged and enthusiastic, and were also interested in physics. The following semester, I offered to work with them on separate reading projects related to ground state properties of quantum spin chains which formed the basis of their undergraduate theses. I really enjoyed helping them succeed at taking on these challenging topics. Both students are currently in graduate programs, one in the physics department at University of Michigan and the other in the mathematics department at UC Davis, and have aspirations of an academic career. This was a very gratifying experience, and I look forward to working with more undergraduate and graduate students in the future.

*Arizona Spring School.* In Spring 2018, I co-organized the NSF-funded Arizona School of Analysis and Mathematical Physics for graduate students and postdocs. The school mainly consisted of four mini-courses from senior researchers and short participant talks. As a follow up to the school, we organized two smaller meetings focused on open research questions to stimulate collaborations between junior and senior participants. A research project on the spectral gap of a decorated AKLT model was completed as a result of discussions at the second follow-up meeting; see my research statement for more details. We also edited a volume of proceedings for the school that was published through Contemporary Mathematics. This series of events was very successful and has inspired me to continue the tradition. Currently, I am co-organizing a similar school on quantum information in many-body physics at TUM that will take place in Fall 2021. I believe education programs like these are vital for the development of our research community, and I look forward to organizing similar meetings in the future.