

My teaching revolves around two core principles: “Listen carefully to the students,” and “Be flexible.” Teaching is a constant process of discovering what works and what doesn’t. What is effective for one audience may not translate well to another context. My students are my most valuable source of information about how my class is going. I pay attention to what they have to say about their classroom experience. I watch them interact with the material in class and in office hours. And with the information I gather from my students, I adapt. Sometimes all it takes is a small change—a little more time spent on a concept the students are struggling with. Sometimes it requires something bigger—a shift from interactive lecture to more discovery-based methods. I do what it takes to make sure that my students learn in my class, and feel supported in their learning process.

While I did work as a teaching assistant in graduate school, I would say that I really learned how to teach at Canada/USA Mathcamp. Every afternoon when classes were over, we would work with our students on homework for two hours. As we worked, I would find small gaps in knowledge—places where I would need to clarify the next day. I also had the opportunity to ask my students questions about how the class was going, how the pacing felt, and where they wanted to see the class go next. I learned to seek out my quieter students at meal times and in the evening, hanging out in common areas. These conversations allowed me to make small changes in my day-to-day lesson plans that made my classes smoother and better. But more than that, they helped me to develop the bouncy, goofy, approachable teaching persona that I use today. Even now, when I teach a Mathcamp class I check in with my students constantly, to keep the pacing of the class in that sweet spot where students are challenged but not overwhelmed. It allows me to teach ambitious, fast-paced classes in advanced areas of mathematics to an audience with lots of mathematical talent, but not much background.

University teaching is a different ballgame. I can’t rely on spontaneous conversations around the dinner table to check in on my students. My time with them is limited to class time and office hours. I need to be able to use this time effectively to get the information I need from my students. One of my favorite tools for this is guided in-class activities. I come to class with a carefully crafted worksheet, twelve dry erase markers, and two extra erasers. I give a five to ten minute lecture, introducing the assignment and reminding my students of its context in the class. Then I break them into groups of three or four, send them off to the boards, and watch them work.

I like having my students at the boards. It is a natural space for them to share with each other, both visually and verbally. Students can interact with half-formed ideas and pictures on the board rather than having to wait until someone has a fully-formed idea in their notebook that they are prepared to explain. From the center of the room, I can see at a glance what each group is working on, who is making good progress, and who might need a hint. I float from group to group, gently guiding the direction of the mathematical discussion and the group dynamics. I might suggest to one group that they look through their notes for the formal definition of a key concept. In another group, perhaps one student has been dominating the discussion, so I may ask the other students a few questions and remind them that they also have valuable insights to contribute. One group might have all of the key pieces of a solution on the board, but have trouble putting it together. I’ll ask

them to explain as a group what they have written on the board, ask them to explain each piece, wait for the moment when one group member suddenly understands, and leave them to explain their insight to the group.

Observing my students engage in group work allows me to understand the mathematical life of my classroom in a deeper way, and to tailor my teaching to the needs of my students. For example, in my vector calculus class, I realized over the course of an assignment that my students were having a difficult time applying Green's Theorem. We had a discussion the next day about what sorts of features in an integral suggest that using Green's Theorem would be a good strategy, and how to use the theorem to transform an integral in either direction. We revisited the themes of this discussion when we talked about the Divergence Theorem and Stokes' Theorem. And when my students tackled the worksheet problems for those sections, they did so with a much more focused strategy. The same sort of guided group work can be helpful in upper division classes, helping students to come to a deeper understanding of abstract definitions. I use these activities regularly in my real analysis class, and in my math logic class this technique meshed so well with their learning style that by the end of the semester we had switched to an almost entirely inquiry-based class centered around the group work.

This sort of teaching comes with its own challenges. Students have a wide spectrum of ability, preparation, and confidence levels. In a diverse school like the University of Arizona, some students have language barriers. Running group activities in a way that is beneficial to all the students in the class takes patience, social intuition, and careful attention to detail. It also helps to know a lot about your students. Who is confident and who is uncertain? Who is quiet and who is outgoing? I get a fair amount of this information out of the group work itself, but I also try to actively encourage my students to seek me out during office hours.

After the first midterm, I encourage my students to sign up for a fifteen minute one-on-one meeting with me. We'll talk about the exam itself, and also their experience being in my class and studying for the exam. We'll discuss strategies they can use to do better in the future, and things that I could do that might be helpful to them. A calculus student suggested that I give them time to draw their own pictures before I draw an example on the board. An analysis student suggested that I assign optional challenge problems so they can spend more time wrestling with definitions. This kind of information allows me to adjust my classes and design assignments in a way that I think will be genuinely good for everyone.

By the end of a successful semester, my classroom is a learning community, in which students feel comfortable interacting with me and with each other. I've seen my students sitting together in the math tutoring room and in the library during exam weeks, talking about hard problems I've assigned, and explaining the material to each other. And these relationships and habits extend beyond the duration of my class. I recently saw a pair of students from my vector calculus class working on their differential equations homework together. One of the students from my Calculus II problem solving seminar has found a group of students in her vector calculus class that she enjoys working with—they set up camp in the hallway on my floor, and occasionally duck in to ask me questions when they are stuck.

As I move forward, I want to continue to do this kind of teaching, grounded in good relationships with my students. I want to be not only a teacher, but a mentor, involved in my students' academic careers after they leave my class. I want to be a part of the life of the school community, giving my students advice as they progress through the major, having some of them in multiple classes, and possibly getting a few started on their first research project. I love working with young mathematicians, and I look forward to being able to interact with them even more in the next phase of my career.