Statement of Teaching Philosophy — Justin Z. Schroeder

"The doer alone learneth." In my career as an educator—whether teaching abstract algebra, calculus, or computer programming—these words of Friedrich Nietzsche have proven to be true in every classroom: the active students are those that succeed. The driving force behind my teaching philosophy is the desire to encourage every student to be an active learner. By the time they reach college, many students have settled into a routine of memorization and regurgitation to get good grades, with no real understanding of the underlying material. This approach fails to prepare students well for a career beyond college, where the problems they face are no longer from a textbook. Therefore, I do not simply want to teach my students how to solve specific types of problems, but rather to equip them with several critical thinking and quantitative reasoning tools for analyzing any type of problem they may face in the future. I would consider a class I teach a success if by the end the students are able to get from point A to point B by deducing a series of logical steps, not by following a memorized pattern. Encouraging every student to be an active learner is a challenging process that can be facilitated by the pursuit of the five goals explained in Section 1 below. I close in Section 2 with a presentation and brief explanation of my personal mission statement as a teacher.

1 Five goals to facilitate active learning

Goal #1: Make the students *the focus of the classroom.*

With limited time in a classroom, it is important to allocate that time to the topics and concepts with which the students are most unfamiliar. By starting my lecture with a problem that the students likely cannot solve at first, but should be able to solve by the end of the lecture, I encourage questions that help pinpoint the key issues we will focus on for the day. This inquiry-based approach has helped students realize what they know and what they don't know, which is a vital step in the learning process. One student commented, "I really enjoy being in your class and having the goal problem, so I know if I can do it, then I learned what I was supposed to." I also put my notes on slides, which allows me to save the board (and more time!) for answering students' questions and helping them solve problems. This split makes it easier for both myself and my students to organize our notes, and the slides serve as a handy reference that is not in danger of being erased as our meeting progresses. Most importantly, it limits the amount of time I spend on presenting information that is readily available in the textbook, allowing me to focus on the questions that are most useful for the students.

Goal #2: Encourage collaboration over competition.

Despite my competitive nature, it quickly became apparent that if I wanted to succeed in graduate school, I could not try to solve every problem completely on my own. Likewise, collaboration is going to be vital to my students' success after they graduate, so it is a bit counterintuitive to expect them to complete my courses entirely independently. Therefore, I provide as much time as possible during our normal class meetings for group-based work. With the proper motivation—which has included presenting solutions to the class, reviewing for an exam, or even making group work part of their exam grade—the collaborative environment has elicited a wealth of (mostly!)

useful conversation. Feedback on group work is generally positive (64% of students in my most recent survey responded favorably about their group work experiences), and I am confident that I can improve this percentage, especially for upper-level courses, by putting less weight on timed exams and more weight on challenging the students to come together as a group to solve difficult homework problems. As much as I like having exceptional students that can easily solve any problem I give them, I take even more joy from watching two or three students work together to arrive at a solution that no one of them could have produced on their own.

Goal #3: Allow the freedom to make mistakes.

While small children have a natural willingness to try new things without worrying about failure, by the time many students reach the college level this freedom and curiosity has been replaced by a paralyzing fear of being wrong. Faced with a new challenge, many simply resort to saying, "I don't know where to begin" and waiting for someone else to provide them with an answer. I try to counteract this attitude by regularly having students solve problems at the board and encouraging them through the process whether or not they arrive at the correct solution. This approach proved to be especially successful when I used a modified Moore method while teaching abstract algebra at George Mason. Some students initially struggled to adjust to this new method, but as the semester passed many students showed an increased willingness to participate, and I had more students visit my office hours from that group than from any other course I've taught. Watching their attitudes develop from confusion to curiosity to comprehension over the course of the semester was easily one of the highlights of my time at George Mason.

Goal #4: Engage students outside the classroom.

I have yet to find a college course in which two or three lectures per week is sufficient for a student to fully grasp all of the material presented. Moreover, working with students outside the scheduled class time allows me to interact with them individually or in small groups and provide more personalized instruction. My goal is that my office hours are so helpful and that students feel so welcome that they all become repeat visitors. I would love if every student shared a former student's sentiment that "he is extremely helpful and goes out of his way if a student needs help". I consider our time together in the classroom as just one piece of a larger puzzle, and I encourage my students to pursue all of the resources at their disposal, especially my office hours. Taking this personal instruction to the next level, I have a passion for leading undergraduate research projects in the areas of combinatorics, graph theory, and their applications. My first attempt at leading such a project far exceeded my expectations, leading to three publications coauthored by students and an award-winning presentation from one of the students at a regional MAA conference. I am eager to be surprised again by what students can accomplish when presented with an opportunity to engage in genuine mathematical research.

Goal #5: Be an active teacher.

If I expect my students to be active *learners*, it is only fair that I strive to be an active *teacher*. Simply put, I try to lead by example. My attitude in class is often emulated by the students, so it is necessary that I approach each lesson with a noticeable vigor. One student remarked, "Your joyous perspective on such a dreaded subject makes this class a whole lot less of a headache"—high

praise indeed from a non-math major! To maintain an active approach to teaching, I frequently solicit input from my students and do my best to address suggestions for improving their learning experience. In a midterm evaluation for my Calculus II class one semester, it was brought to my attention that the students were having a hard time connecting my lectures with the textbook. From then on, I started each class with an outline of the key terms and ideas we would discuss and a reference to where they could be found in the book. I also seek advice and input from other teachers; for example, the idea (discussed in the first goal above) to start each lecture with a challenging target problem came from a computer science teacher at George Mason. Most of all, I am willing to try new ideas in the classroom—fully aware that not every innovative idea will prove to be a huge success. As long as I continue to learn from my mistakes, I am confident that I will grow as an active and successful teacher.

2 Personal mission statement

To encourage students to be active lifelong learners and to help them prepare for the future by equipping them not only with knowledge, but with the conviction and confidence to use that knowledge in pursuit of the common good.

"To encourage students to be active lifelong learners..."

When I reflect on my own time in college and graduate school, the important outcome was not *what* I learned, but rather *how* I learned; this process continues to be useful to me on a daily basis, and I want to share this attitude and mindset with my students.

"...and to help them prepare for the future..."

My goal is not necessarily to help students complete my course, get a good grade, or even graduate (although these are all good things!); my ultimate goal is to help them prepare for the rest of their lives, both personally and professionally.

"...by equipping them not only with knowledge..."

Students don't need to memorize facts that are easily found on the internet, but they do need to learn both historical truths and contemporary challenges related to their chosen course of study.

"...but with the conviction and confidence to use that knowledge..."

Learning new information is good, but to truly succeed a student must recognize why that information is important and understand how to put it into practice.

"...in pursuit of the common good."

As a teacher, I don't merely educate students; rather, I feel a personal responsibility to help prepare the leaders and laborers who will shape the course of history for the next generation.