

Teaching Statement

While learning mathematics is a common experience to all high school and university students, what a student takes away from this learning is unique in that the outcome depends on his or her interests, talents and, most of all, instructor. I am equally interested in both teaching and research, but my motivation for writing a PhD is to teach at the university level. There are different styles of teaching that succeed for different types of students. Whereas a high school teacher might need to encourage students to want to learn, a university teacher is given students who already want to learn, but who might not know how to achieve the high goals that they set for themselves. I choose to be a university teacher because I possess a natural talent for rigorously challenging my students in a captivating manner in order that they develop the confidence and skills necessary to achieve their high goals. I was asked in a previous job interview by Hubert Silly at the MBA Center why I wanted to teach. I responded, "I'm a natural teacher. I wouldn't want to do anything else." In a subsequent interview, I was asked to give a sample lesson. Mr. Silly confirmed afterward, "Yes, you are a natural teacher. You will not need anymore training. Are you free to teach tomorrow night's class for me?"

In this teaching statement, I give my motivation for pursuing a teaching career, my teaching style and goals, and finally some of the positive feedback that I have received from my students.

I consider teaching another type of research, an important one that is constructive in augmenting ones own research in mathematics. Not only does a teacher learn and review mathematics in the course of a teaching a class, but also he or she is constantly growing intellectually by learning what makes students appreciate the mathematics. Teaching is certainly not a passive job, where a given lesson plan is always followed to the letter, but an active one where a teacher must react to the students' input and improvise daily. One example of this happened last week when I outlined a combinatorial method of calculating a probability. My student, John, asked in class if some other method that he volunteered would also work. My response was to jump on this opportunity of teaching the scientific method. I first emphasized with an obvious smile, that this was a very intelligent question and I thanked him for asking. A sharp negative answer to such a question might discourage student participation, whereas I certainly want to encourage it. I then said, "Well, let's check," and proceeded to calculate the proposed solution, which was different than the correct solution. I then emphasized that, by experimentation, this solution must be incorrect and

said, "This doesn't work, but I don't know why." Then I took a seat in the classroom with the students and just looked at the blackboard. This passivity on my part forced the students to analyze the incorrect solution by themselves, and they did so with maturity and grace by eventually discovering the correct analysis. I only acted by asking them pointed questions leading to the correct solution.

A teacher often plays an unexpected and important role in a student's life and career decision. I cannot take the credit for being a natural teacher, as I was influenced by my own excellent college mathematics instructors. I started college with the aim of studying German, but eventually studied mathematics because my college calculus instructors taught me to love it. Just as they gave me the confidence and knowledge to succeed, so would I like to continue that legacy. Their classes were not only engaging and passionate, but they also saw in each student, including me, some weaknesses to be forgiven and some talent to be exploited. I use my own calculus instructor's model of exam grading as well as my number theory professor's model of class pace.

A instructor's style is a complex mix of his or her education, experience and personality (among other influences). The following examples illustrate how my own teaching style reflects a love of rigor, a respect for my students and an engaging and friendly classroom presence. A university instructor has the task of conveying an entire week's learning in a few hours. In order to do this successfully, the students need to be engaged throughout the lecture, since there is no time to waste. For this reason, I list what we are going to learn every day at the beginning of the class period, much like the introduction to an article. Even if the concentration strays, the main idea will stick. Furthermore, a concise summation facilitates students' review of their notes. In the presentation of the material, a concept should be preceded and/or followed by an example of it, since in mathematics comprehension of a concept goes hand in hand with the ability to apply it to an example. I often present a few examples before stating a general principle and give the students the chance to generalize from the examples, i.e. formulate a hypothesis according to the scientific method. I trust the students' ability to be analytical thinkers, and therefore encourage participation and even guessing. This Socratic method forces students' interest and reinforces their confidence. In order for this method to be productive, an instructor must know students' names. I have them memorized by the second class period. I sometimes illustrate an incorrect theory on the board next to a correct one and call on a student to choose the appropriate theory. For example when teaching inverse functions, I will ask students to find the inverse to x^3 and then to x^2 . In this way, a student is forced to come up with the idea of the 1-1 criteria for the inverse of a function. This example of teaching by comparison illustrates an element of my teaching style which is based on my goal of reinforcing critical thinking and self-confidence in my students.

The methods of teaching that I outline in this statement come naturally from my enthusiasm for the subject, and I believe that students deserve 100% of an instructor's enthusiasm, since we expect the same from them. It is the obligation of the instructor to ensure that students leave a classroom with the feeling that

the hour they have just spent has helped them reach their goals. For example, a student's main objective in a course may be to obtain a good grade, and this goal should be respected. An instructor has the responsibility of presenting enough material for hard-working students to do well if they wish to do so. Similarly, a student's objective may be to learn the necessary mathematics in order to proceed to more advanced applied studies. An instructor owes such students the opportunity to meet this goal in his or her class. I plan my course curriculum with an appropriate emphasis on continuing in engineering, physics, statistics and/or pure mathematics. In the undergraduate math level, it is easy to find applications of what we are studying and the students deserve the instructor's guidance in this respect. I give the students the opportunity to understand why they are calculating and not just simply how to calculate.

One goal of undergraduate education is to prepare students to work in a professional situation by providing them with a general advanced education in all areas and a superior education in their specialized field. It is necessary to present courses that are challenging in order to improve students' analytical skills, a talent applicable throughout life. An undergraduate institution is a place where students may explore their intellectual capacities and interests. As an instructor in such an institution, I strive to encourage my students to create, build, lead and construct their minds. The products of this effort are their future successes. A mathematics course encourages students to harness and discover their own abilities, since they are required to analyze, work long hours diligently, solve problems, apply their solutions to practical problems and deduce truths from these efforts. I apply this philosophy to my teaching style in order to encourage my students to nurture their natural analytical thinking skills.

In this last section, I will provide a flavor of how I am perceived by my students and peers. Throughout my teaching career, my students and colleagues have given me positive evaluations. Unquestionably, it is important to constantly mature as a teacher. Just as the students should learn in every class, so too should the instructors constantly strive to become better instructors. I take the opportunity to learn from the influential teachers in my department and also from pedagogy experts. This year, I attended a teachers' training seminar at the University of Pennsylvania with some outstanding role models, calm and exciting educators with an infectious talent for conveying mathematics. I learned many new techniques there, such as always writing on the chalkboard in exactly the same way as the instructor would expect to see the homework solutions. On the other hand, it is essential to come into the classroom with enough experience to be a decisive role model to the students. This year, I won the distinguished teaching award from the mathematics department at the University of Pennsylvania for receiving a student rating of 3.74/4 in the combined criteria of communicating class material, concern for students' learning, knowledge of course material, blackboard writing, speaking clearly and conscientiousness in holding class. The students at the University of Pennsylvania are critical evaluators, giving an average score below 3/4 in their teaching reviews. I will end this statement with a short collection of comments received in the past year:

- “Sarah Carr is the best recitation leader I have ever had at Penn. I wish she were the actual instructor for the entire course. I learned all of the material from Sarah and her helpful review sessions.” -Anonymous
- “I hate missing your recitations because I learn so much there.” -Meghan
- “Sarah’s great. She’s the first TA I’ve ever had who I actually learned something from.” -Mariama
- “Dear Sarah, I just wanted to thank you for all of your help and encouragement. Although the course was tough, you are the nicest TA ever.” -Dana
- “Of all the TA’s I had, you are the most accessible, patient and knowledgeable one I’ve worked with.” -Minh
- “You are the best TA ever!” -Patrick
- “I think the way you explain the problems is very helpful.” -Xixi