

# Teaching Statement

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A teacher in a university setting has two sometimes conflicting assignments. The teacher has the role of a “judge”—he is responsible to evaluate the learning and performance of the students and ensure that grades earned in his class are meaningful and fair. On the other hand, the teacher must also be a “coach” for the students. While the former role is important and cannot be neglected, I believe that the most successful teachers are those who can emphasize the latter so that the students see the instructor as being on the same team as they are.

One of the most important attributes of a successful mathematics coach is his enthusiasm for the subject. This is important even when the students are self motivated and interested in mathematics; in a lower level undergraduate class where this is often not the case, it is essential. I try to let my enthusiasm show to my students, while at the same time acknowledging that math can be hard work. One of my students in a course evaluation observed, “Mr. Johnson is clearly passionate about math, wants to see his students succeed, and his slight eccentricity made what could otherwise have been a very boring class quite enjoyable.”

Teachers should be approachable and available to students. I have taken classes where I had an idea that I wanted to discuss with the teacher after class, but the teacher walked straight out of the room when the lecture was over before anyone could talk to him. I make it a habit after the lecture to stay in the front of the classroom with a smile on my face and wait, not even erasing the board or gathering my materials until the students have left. I find that many students with a quick question will come talk to me in this context, when they probably would not have taken the time and trouble to come to office hours.

It is important as a mathematics coach to emphasize to the students that success at the undergraduate level comes through hard work and proper preparation, rather than some native quality of being a “math genius”. While interests and aptitudes do vary, students who label themselves as “not a math person” often create a self-fulfilling prophecy by increasing their anxiety and avoiding the work necessary to succeed.

Students in an undergraduate classroom have diverse interests and motivations, and a good teacher must make the material relevant to them. While some are motivated by the quest for “pure knowledge” (though even these students need to be shown the “abstract” questions that the content is answering), I like to try to appeal to other students as well, using stories, history, philosophy, or concrete comparisons. For example, in a class that covers the sum of an arithmetic sequence formula, I like to frame the exposition with the legend of young Gauss thwarting his elementary school teacher’s attempt to assign a difficult task. When introducing the exponential function, I like to show how long it would take for the graph of the function to reach the moon (not very long!). When talking about convergent infinite sums, I bring up Zeno’s paradox, as well as the closely related problem: “If you need

to mail a letter, and you walk halfway to the mailbox, and then half the remaining distance, and continue this way, will you ever reach the mailbox?” (One possible answer: “I always approach mailboxes that way.”)

One future goal that I have is to learn how to help students become better at writing in a precise language. This is possibly one of the most important transferable skills that studying mathematics can develop—being able to write clearly and carefully is a valuable but unfortunately far from universal skill in many areas. Many students’ answers to homework or test problems are scratch work, containing unorganized strings of numbers and symbols often representing false statements or meaningless expressions, rather than a readable, linear explanation of a solution. Traditional methods of grading math assignments often don’t encourage good writing. What could a teacher implement to guide his students towards skillful mathematical writing?

As I become more senior and involved in planning curriculums, I am interested in evaluating the purpose of the math classes we teach at an undergraduate level. In some classes I have taught, I have noticed that there is sometimes a disconnect between the stated purpose and the content of the course. For example, I recently taught a course targeted at pre-business students (many of whom would never take another math class) that contained a unit on linear algebra. Interpreting answers to realistic problems as solutions to linear systems seemed very relevant, but a lot of the time in the unit was absorbed by having the students row reduce matrices by hand, which may have been a less effective use of time and the students’ energy. Of course, just because a technique itself is useless in the business world does not mean that it has no value in the pre-business math course. After all, part of the purpose of mathematics education is to teach students how to think. But for this goal, it seems that topics could be selected based on their likelihood of inspiring imagination and thought. Along similar lines, in a consumer math class that I taught, I felt that knowing the difference between a loan amortization formula and a future value of investment formula was quite relevant. However, having the students type the long, complicated expressions in a simple calculator was often discouraging and irrelevant.

I am also interested in promoting interest and excitement about mathematics by giving popular math talks or similar activities. I have given several talks to high school, undergraduate, and graduate audiences. One of my favorite topics is the Busy Beaver function, a sequence of numbers that grows so fast that it is provably uncomputable. I like topics that inspire the imagination and ask apparently “simple” questions whose answer is interesting or still unknown. Recently, I volunteered to fill an emergency cancellation in the graduate student colloquium by re-giving a talk that I had done three years before. One of the students who had attended both lectures commented to me afterward that he thought the second time was better because I was more comfortable with the audience and having more fun. I would like to continue volunteering for these kind of opportunities and refine my skills and confidence.

Becoming a great teacher is not something that can be accomplished without thought and effort. I look forward to growing and improving in my next teaching responsibilities.