Teaching Statement
Howard Nuer

Teaching mathematics is one of the great joys of my life. In my service as a teaching assistant at Rutgers and the Hebrew University of Jerusalem and as a private tutor, I have enjoyed the more direct contact with students afforded by these smaller class sizes. This has provided me the chance to tailor my explanations to individual students until I finally got to see that spark-like moment of understanding. Students may believe that teachers enjoy the smarter, more advanced students. This is not true of me, however. Advanced students in an introductory course often do not need my guidance. Instead, my favorite teaching experiences have usually been with struggling students who are willing to work. That moment, when a student begins to see their hard work pay off, is one of the aspects of teaching I cherish most.

At Rutgers I have been both the principal lecturer for courses (Topics in Mathematics for the Liberal Arts, Honors, Fall 2015; Multivariable Calculus, Honors, Spring 2015) as well as a teaching assistant (Calculus II for Mathematical and Physical Sciences, Fall 2014; Differential Equations for Engineering and Physics, Spring 2014; Multivariable Calculus, Fall 2013). When teaching the honors section of Multivariable Calculus, I adhered to a very rapid and strict syllabus from the department while having full responsibility for writing and grading the exams. In teaching Topics in Mathematics for the Liberal Arts, however, all parameters of the course were up to me. I designed the entire curriculum, supplementing both sections and exercises in the textbook with material from other sources. Students taking this course were bright and hard-working, but nevertheless suffered from a fear of mathematics. Although it was initially a challenge for me to explain some of the elementary concepts from number theory and combinatorics necessary for elementary cryptography (the topic of the course), I was relentless in my efforts to connect to my students. I would often employ numerous styles of explanation, such as drawing pictures, telling stories which encapsulate the mathematical principle, and of course basic algebraic manipulation, in order to reach as many of my students as possible. Sometimes I would even confer with other teachers to find a way of explaining a concept that I might not have thought of myself.

As a teaching assistant, my duties included writing and administering quizzes, grading, and covering the solutions to selected homework problems and examples. In addition to these duties, recitations of Calculus II at Rutgers entail an additional component, the workshop. During this component of the recitations, it was my responsibility to guide the students through more challenging and conceptual problems as they worked together in small groups. I always sought to provide students with just enough direction to enable them to discover the solution for themselves. At first my hints seemed useless, but the students thoroughly enjoyed the dawning of discovery that these hints brought. It is a highly nontrivial task to inspire the solution in a student’s mind without directly giving it to them, but it is a task I enjoy.

While the workshop style is not the typical teaching format one encounters in an academic career, I believe my enthusiasm for it displays my love of teaching as well as my desire to truly inspire others to understand. It is also a format that I have had previous familiarity with as a
counselor at Ohio State’s Ross Mathematics Summer Program. Guiding my students that summer toward the self-discovery of the foundations of elementary number theory, through cryptic but suggestive hints on their problem sets, is most likely what cemented my subsequent love of teaching.

In teaching my own courses, I have also gained experience in the lecture hall. As opposed to recitations, where I played a supplementary role, in the lecture hall I had the opportunity to present material firsthand in a way I believed to be correct and easiest to digest, and as you can see from some of the student reviews below, it seems that I was successful and that the students appreciated my approach to teaching. While I believe I am most effective in smaller settings, where I can pinpoint exactly what each individual student does not understand, I nevertheless succeed in clearly delivering even complicated material and reaching the majority of my students in lectures.

In addition to my official responsibilities teaching in the classroom, I have twice mentored mathematics majors doing independent reading in more advanced mathematics as part of Rutgers' Directed Reading Program. In my most recent experience, I lead a student through some of the most beautiful pieces of elementary number theory using the theory of continued fractions. The beautiful theorems one can obtain with such a simple apparatus genuinely excited the student and encouraged him to learn more advanced areas of number theory.

I would like to take a moment to explain my approach to undergraduate teaching. I have found that the most common source of students’ confusion in tackling problems is that mathematics seems like a collection of unrelated magic tricks to them. In lecture, students generally see an example worked out as one self-contained unit with little or no explanation of how this example fits into the bigger picture of everything they have seen before or how they themselves should know what to do when encountering a similar problem. While covering examples in both recitation and lecture, I strive to demystify mathematics by placing each new problem and technique in the context of previous material, by explaining how one would come to a particular solution, and by breaking solutions up into manageable chunks. For example, numerous students in my Calculus II course commented with trepidation that they had heard that sequences and series are totally different than anything before them in Calculus and wondered if this was true. When we reached that material in the course, I indicated through numerous examples how the tools they had learned before could be used to tackle these seemingly different problems. I showed them how the entire course was really one cohesive whole.

The reason I take the approach above, and indeed another goal of my teaching approach, is to bolster students’ confidence. Too often, students feel that they simply do not have a “math brain.” Solutions seem to come out of nowhere, and problems appear entirely unrelated even if they are almost identical. All of this leads to that “deer-in-the-headlights” moment when they see a new problem and do not know how to start, begin to panic, and start to feel like they just cannot do math. While I cannot deny that natural mathematical ability makes math relatively easier and can make the difference at higher levels, few-to-no problems students encounter in service courses such as Calculus involve the kind of cleverness and ingenuity exhibited only by the best students. I emphasize at the beginning of every semester that each and every student can succeed in these courses if they put in the work and that I am there to help them do so.

I also use a few more practical techniques to help students overcome these issues and feel like they really can do mathematics. The first two techniques are explaining how one is naturally led to the solution I present and breaking up solutions in smaller steps based on problem type, as men-
tioned above. Another technique I often employ is to emphasize the need to just try out ideas. I explain that everyone, professional mathematicians included, gets that feeling of not knowing what technique will work for a given problem. When working a problem at the board, I will often ask the class what we should do and proceed with a suggested approach I know will not work. I encourage my students to simply try out their ideas for solutions as I believe this to be the only way they will ever build up enough intuition to know what will in fact work. This technique was especially important when teaching Math for the Liberal Arts. The students entered the course already feeling like they were not good at math, so encouraging them to just try out ideas, and then asking very directed questions to guide them when they got stuck, helped build their confidence. Another technique I like to employ, both in office hours and smaller lectures, is to have a student explain his or her correct solution to the other students. I have noticed that students tend to understand and remember a piece of mathematics better when it comes from their peers, and this technique helps the students express mathematical ideas precisely and in their own words. A final technique I use is simply to remind students not to freak out. During the final exam for Multivariable Calculus, I wrote the words “don’t freak out” on the blackboard and garnered a laugh from the class. After the exam, numerous students commented how that actually helped them remain focused and calm during the exam.

I begin each semester by telling my students that if they are too embarrassed to make mistakes or ask questions and appear stupid, then it will be difficult to improve and even harder for me to help them. I encourage them to disregard their fears of appearing stupid in front of their friends and just ask questions when they do not understand, because, usually, if one person has a question, most of the class does as well. Of course, not many students take the plunge and ask their questions during class, so I make myself available for questions any time over email. I also try to provide as many office hours as my outside responsibilities will allow. I want my students to know that I am there to help them and want them to succeed.

Let me conclude with a few selections of my students’ comments from the Rutgers teaching evaluation surveys:

“Howie was the best TA I’ve ever had. He made the material easier to see, and he was willing to change his teaching methods for the better of his students.”

“All the examples were very helpful, as were the step-by-step processes to solve certain types of problems.”

“Howie helped me to see that math isn’t “black magic” as he called it. He made things simpler by giving us steps on how to do things. Best teacher I have ever had hands down.”

“Mr. Nuer is the most helpful instructor I have ever encountered at Rutgers. His attempts to answer and assist students both inside and outside the classroom are unparalleled.”

“Professor Nuer was an awesome TA. He was so helpful, and I never felt afraid to ask questions. He was really good at explaining concepts that everyone was confused on in a way that we actually understood it afterwards. He was great at breaking concepts down and making sure we understood what we were doing and why we were doing it.”

“He was a great teacher. He went out of his way and took extra time out of his day to help us whenever we needed it. He really made me feel like I can do math, that I am smart, and that I can do well. We were really lucky to have him as a TA.”

“Overall better than the professor. Should have taught the course.”

“He was always incredibly understanding and kind to whoever was asking a question. I never felt bad or “stupid” for approaching him for some help. He seemed to understand that not everyone
can just magically get math, even in a higher level course, and easily skip certain steps while solving problems.”

“He encouraged questions which I found extremely helpful, especially since it was a recitation class.”

“I wouldn’t have done well in this course if it weren’t for Howie’s ability to simplify the material we learned.”

“Howard was the greatest TA I’ve had here at Rutgers.”

“He was able to explain difficult concepts so that everyone could understand them and was humorous and interesting, all while being professional, intelligent, and organized.”