Teaching Statement - Matthew J. Willis

My teaching philosophy is perhaps best summarized by the phrase "active and willing participation". When in the classroom I strive to create an atmosphere in which students are both expecting to participate throughout the lecture and happy to do so. This is not always easy to accomplish and is at least partially dependent on the specific group of students. However, I feel that I have the right personality and a finely-tuned lecturing style that helps students feel comfortable providing answers and explaining concepts without being forced to do so. I think this type of environment gives the students a better appreciation of the material, allows them to get more enjoyment out of the class, and builds their confidence as growing mathematicians. As such I do my best to construct this type of environment in all classes I teach, regardless of the level.

I find that the best way to create a high comfort level for the students is to be honest with them from the beginning, especially in classes where most students are not math majors. I tell them up front that I didn't enjoy being forced to answer a question when I was a student, and so I won't do that to them. Instead, early in the semester I pause as long as necessary after asking a question to receive a response. I also repeatedly tell them that I want to hear any question they might come up with throughout the lecture, even encouraging them to simply say "Can you go over that again?" when they don't know what to ask. Since students often have different expectations for their math courses compared to other disciplines, I find it important to emphasize early on that this type of participation is strongly encouraged. I've found that generally by the second week of classes students are coming to my courses expecting to participate and willing to ask questions, and that they enjoy being involved in this manner.

I think it's fair to say that this strategy has proven to be effective in my time at Connecticut College. During my first two years here I had the opportunity to teach Calculus B, C (which most schools might call Calc 1 and 2), and Multivariable Calc in consecutive semesters. Several students took all 3 courses, which was often to their own surprise based on their previous math experiences. I could see the growth in many of them from scared freshmen to increasingly confident amateur mathematicians, and I feel that allowing and encouraging them to participate regularly throughout the semester was the main stimulus for this change. The Multivariable course was perhaps my favorite class to date, as the high level of familiarity between the students and myself created a very comfortable and active classroom environment. Some of these students are now declared as math majors, including a few who told me directly that they never planned to take more than one math course, or that they "hated" math in high school. These types of results are what make me proud to be a math professor.

On the other side of the coin, I've also been able to teach some of the upper level courses for our math majors and minors. As you are probably aware, it can be difficult to use the word "proof" in an intermediate level course without instantly creating a panic. In my Discrete Math and Linear Algebra courses, several students entered having never written a real proof before. Again I find honesty to be the best policy, so I inform the students that we have to get over any sort of fears to complete the course, but that we are "in this together". I try to establish a sense of teamwork in these situations, where I'll give a few sentences of explanation and then turn to them for the next line. I also find it best to get the students involved with proofs early while the material isn't too difficult, and they seem to respond positively to this, after the initial fear of course. Since there is generally a wide variety of student ability in these intermediate level courses, one never knows quite what to expect as an answer or explanation. As a result I've found it crucial to be able to take any student comment, no matter how off-base, and spin it into a positive one. I believe that I've gotten particularly adept at this over the years and it seems to be a major factor in keeping the students involved with proofs.

This past Spring I had an opportunity to teach a Selected Topics course in my area of research, algebraic combinatorics. This course was exciting and challenging at the same time as I was essentially creating it from scratch, which was a new experience for me. I was very pleased with how it turned out, as we covered

a lot of material and most of the students seemed to be following the entire semester. I was particularly glad to learn that the students picked up on the computational combinatorics quickly, for two reasons: First, this left us adequate time to talk about theoretical results in both combinatorics and representation theory, where we discussed some very basic Lie algebra problems using matrices. Second, I believe it is a strong indication that I'll be able to provide several opportunities for undergraduate student research in the future. Combinatorics lends itself nicely to student research in the first place, so with this reassurance on my topics of interest I'm excited to get involved in a project or two soon.

The course I've taught most frequently here at Conn is our Introduction to Statistics course, which is a course that satisfies the school's gen. ed. math requirement. Most of the students are either enrolled in it for that very reason, or are Economics or Psychology majors who will need to use the material going forward. This leads to a wide variety of both student ability and interest level, which can be quite a challenge. I've made multiple changes to the way I run this course in an attempt to accommodate this student variation. For example, the first semester I taught the bulk of the material using Beamer slides created in LaTex. I thought this would save the students a lot of note-taking and free them up to think about the topics and react much faster. When the course evaluations came in, I learned that many of them found this to be a boring way to learn mathematics. If only they had thought to tell me during the semester! Nowadays my lectures are mostly done on the chalkboard, and the slides have simply become a study resource that I provide to the students. From examples like this I've learned how important it is to continuously analyze my lectures from scratch, especially in a course that I've taught frequently in the recent past.

The Statistics course has also provided the biggest opportunity for me to use technology in the classroom. Once a week the class meets in a computer lab where we work through problems using Excel. I would not claim to be the world's foremost expert in Excel, but I am certainly comfortable with the topics covered in an introductory level Statistics course. The regular classroom is also well equipped, so among other things I can use the document camera to teach students how to perform the procedures we're covering with their graphing calculators. I'll also use the internet when appropriate, for example the Powerball website makes for a few fun problems when we're learning about Probability. I also have experience with web-based homework sites for Calculus and Statistics courses which I used regularly before arriving at Conn. Though it usually takes the students some time to come around, I've found that the instant feedback these sites provide can be quite valuable for them.

Lastly I'd like to touch on my experience with diversity in the classroom. My first job out of graduate school was at an institution that did not value it very highly. In the three years since I've been fortunate enough to work in an environment here at Conn that makes diversity one of its top priorities. This distinction was very eye-opening for me. Recent data shows that students of color made up between 17 and 22 percent of students in Conn's last few incoming classes. It's been great interacting with students of varying backgrounds. I've learned a lot from one of the first statistics example I do each semester where we produce a bar graph to depict the birthplaces of all students in the class. The first time doing so I was caught off guard by the variation, and in subsequent semesters I've seen similar reactions from the students. In the math department we recently introduced an AWM chapter. I was very proud to see some of my current female students become founding members. This type of diversity in all levels of math classes should be encouraged and celebrated.

To summarize, my classroom operates most efficiently when the lectures are interactive and the students are heavily engaged. I do my best to bring high energy levels and enthusiasm every day to foster such an environment. I feel that this style leads to a strong sense of interest and enjoyment among the students, even in some who previously never felt such emotions towards a math class. Here at Conn I've had some specific success in attracting, and retaining, students to a mathematics major. I'm comfortable teaching all levels of undergraduate math and have at least some experience with beginning, intermediate, and upper level courses. I plan to bring this attitude and experience to make the next chapter in my career a productive and enjoyable one for myself and my future students.