STATEMENT ON TEACHING

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I started teaching my first week in graduate school. I've taught many sections of calculus (first-, second-, and third-semester). I've taught classes ranging from precalculus up to senior-level courses in probability and topology. I've taught courses in dynamical systems, my research area, and I've taught abstract algebra, although I'm not an algebraist, and statistics, although I'm certainly not a statistician.

I've taught seminars and independent studies in which I do very little talking, but most of my classes are lecture-based. On most class days, we'll cover one new topic. I begin my preparation by doing what Professor Bob Welland, my teaching mentor, taught me in my first month of graduate school: I get the material, the "elements of the story," as clear as possible in my own mind. Why is this the right approach? What assumptions do we need? Which steps require a new idea, and which are routine? If something seems too complicated to explain, keep breaking it down into simpler pieces. It's only after I understand every piece of the material thoroughly that I can think about presenting it to the students. This approach sounds simple, and it is, but I've found it tremendously useful throughout my teaching career.

The way I present the material obviously varies from topic to topic, but I generally start each class with a quick review and reminder of what we've been doing. I often introduce the new topic through a motivating example – our current knowledge will get us part way through it, but then we'll get stuck and realize that we need a new idea. While presenting this new idea, I try to use a common technique in mathematics teaching called "the rule of four." The method is to explain as much of the material as possible in four different ways: algebraically (using symbols and formulas), visually (using pictures and graphs), numerically (using explicit calculations and numbers), and verbally (using ordinary words which, though usually inadequate to explain mathematics by themselves, are helpful when combined with the other approaches). Different people learn in different ways, so the rule of four tries to reach each student in a way that she'll find easiest. At the same time, by making connections and realizing that all four explanations are saying the same thing, she'll gain a more complete understanding of the concepts. I usually finish up by working through some examples (often including some for which our new idea doesn't work, both to motivate the next topic and to remind us that the world of things we understand is much smaller than the world of things we don't).

It's better if the students do the examples themselves, instead of watching me work through them. Often I write a few quick ones on the board toward the end of class, and after they've tried them we'll discuss them. I also give more elaborate worksheets for them to work on in groups during class. While they're working I (along with a math learning assistant, if there's one in the class that day, who has gotten a copy of the worksheet in advance) circulate and give a little guidance if it's needed (at the same time, I get a feel for where the students are and what they're struggling with). I like group work, partly because it makes the students realize that they're all more or less at the same place and that the reason their classmates aren't asking questions isn't necessarily that they don't have any, and because a student has to really understand the material before she can explain it to someone else. I also tend to have groups go to the board and present their solutions to the rest of the class, because I think it's important for them to be able to communicate mathematical ideas.

When I lecture, I use the computer and graphing calculator displays frequently (just how frequently depends on the class: almost every day in calculus, for example, versus a couple times a month in abstract algebra), but I spend most of the time at the blackboard. That way we can work through the material together, without going too fast, and I can make sure that people are keeping up as we go (they also get to see me make mistakes, which I tell myself is useful for them). The exceptions are my statistics classes, in which I spend about half the time at the board and half with slides and applets on the computer. I think the slides work well for stats (we analyze a lot of data, which I can't really copy down on the board, and it's handy to put some of the routine calculations on slides so we don't spend as much class time on them), but I'm still getting used to teaching with them – I worry that people aren't paying attention in the dark, and that we're moving too fast (I do make the slides available online, so they can look again at anything they missed). I try not to show too many slides in a row, and I think I'm getting better at keeping the students involved while the slides are up, but it's something I can certainly get better at.

While my upper-level courses vary, my introductory courses all have essentially the same structure: two midterm exams and a final. I believe strongly in the importance of the learning and re-learning that goes on when students study for exams (especially finals). I hand out practice exams (with solutions) and hold review sessions, both to facilitate and focus their studying and because many of them find that reassuring. I also give daily or weekly homework assignments, because it's crucial that they keep up with the material. Many of my classes also have a final project (often a group project) for which the students have to pick a topic, write a paper, and give a presentation. I think it's useful for them to study an extra topic that interests them and in which they can be the experts, and I also like to give them practice in oral and written communication. I'm trying to incorporate more writing and speaking assignments into my classes; it's awfully hard to find enough time during the semester, but I think it's important.

I have trouble sleeping if I'm not at least a day or two ahead in my lecture preparation. For each class, I have a syllabus and daily schedule online, so the students know in advance what we'll be doing each day and can prepare (I encourage them to read the relevant sections of the textbook both before and after lecture). All the homework assignments are up at least a week, and usually more, in advance. Of course, each class is unique, and all of these plans can change to meet its individual needs, but I feel that the structure is useful for many students, especially since the material can seem intimidating. Much of this organization is just my personality, though, and I'm certainly not claiming that this is the best way to teach. I admire, and envy, my colleagues who can combine preparation and spontaneity, and I'm trying to emulate them in little ways (although I'm not sure that preparing extra examples and deciding which to present based on how the class is responding really counts as spontaneity).

I want the students to be able to analyze questions mathematically, which means that they have to translate problems into the language of mathematics and interpret their solutions. I want them to be able to communicate mathematical ideas, not just to each other but to people without as much math background. I want them to be able to work together, and to be comfortable doing it. Maybe most importantly, I want them to have the confidence to admit when they don't understand something, and the belief that, perhaps with a little help, they can figure it out. I believe that a truly successful student needs this combination of intellectual honesty, humility, and arrogance (and I'm not claiming to have mastered it myself).

Part of the reason that I came to Agnes Scott is that I believe in the importance of a strong mathematics background for women, which they too rarely get. I came here naive about the kind of math phobia that many of our students have to deal with. I envisioned a student who was afraid that she just wasn't good at math. I'd offer her some encouragement and a few brilliantly clear explanations, she'd realize that she could really do it all along, and everyone would be happy. Something like that actually does happen sometimes, but usually a math-phobic student dislikes math intensely and tries to avoid it as much and as long as possible. Figuring out how to reach these students is probably my biggest challenge in teaching. Sarah Winget (in chemistry), Amber Garcia (in psychology, now at College of Wooster), and I are doing a study, surveying math and science students about their attitudes toward these topics and how those relate to self-esteem and gender stereotypes. We don't have enough data yet to draw many statistically significant conclusions (we're still collecting and analyzing data), but what seems clear is that there is a connection between negative attitudes toward math and belief in the stereotype that women are bad at math. When I talked about this at a CTL workshop, one of the students in the audience suggested that providing students with examples of successful female mathematicians (either from the past, or current researchers) might be very useful, and I think that our math learning assistants might be good models as well.

Another challenge is knowing how much structure to impose on the students. Do I force them to do the homework by collecting it every day, or do I just give them the assignment and let them decide for themselves whether to do it? Do I require them to attend class? Do I make them work in groups or come to office hours? Before I came here, my attitude was that the students are adults and should be treated that way; that was the way I wanted to be treated when I was a student. My job was to offer them encouragement and an opportunity to learn; it was up to them to decide whether or not to take advantage of it. What I've found here, though, is that many of our first-year students don't know how to take advantage of it; their high schools haven't taught them how to be students. It's not fair to make them take responsibility for their own education without at the same time giving them the tools to do it. On the other hand, it's also unfair not to let them take responsibility for themselves as soon as possible. So I find that I have more structure and requirements in my introductory classes, while the students in my advanced classes have more freedom. I try to err on the side of giving them too much responsibility – I have no attendance policy, for example – and I'm still trying to learn what the right balance is. (Partly in response to comments on my evaluations, I've tried the following homework policies: collecting all of it, collecting none of it, collecting some of it, and giving weekly quizzes on it. I haven't figured out what's best – it seems to depend on the class.) Different members of my department have very different approaches to this issue, but they clearly respect each other's teaching, and I feel very fortunate to be in that kind of environment.

The course evaluations have also been useful in figuring out how to improve my classes in other ways. For example, students in my calculus classes always want worked examples, so I've tried to include a few more. The first time I taught statistics, I got a lot of comments that the software program we were using, SPSS, was hard to figure out, so Alan and I switched to Fathom, a much more user-friendly program, and both we and the students have been happy with the results. And because everyone except me hated the modeling textbook that we used last time, I'm trying a new one this semester.

Overall, I try hard to be a good teacher, although there's still a lot that I need to do better. It's great to get a teaching evaluation that says "Dr. Wiseman is the best," but all that really means is that the student liked me, which is nice but not the goal. Even better are the ones that say "He actually makes me want to become a math major," but those are really about the subject, not me. I think the best evaluation that I've ever gotten came from a student in my Spring 2007 calculus II class: "Dr. Wiseman showed up happy to teach and extremely prepared." That's true, and it will remain true.